Review of Botrytis Management Practices - Hawke's Bay Region 2004-05 Season

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Report to New Zealand Winegrowers

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EXECUTIVE SUMMARY

Review of Botrytis Management Practices - Hawke's Bay Region 2004-05 Season

REPORT TO NEW ZEALAND WINEGROWERS

Wood P and Gurnsey S October 2005

Botrytis cinerea is present in all vineyards at a variable loading, but only results in damaging bunch rot epidemics when, physiological and other triggers cause berry tissues to become susceptible in combination with suitable environmental conditions. Weather conditions immediately pre-harvest in Hawke's Bay this past season were ideal for bunch rot epidemics.

A survey of botrytis levels in Hawke's Bay Chardonnay blocks from the 2004-05 season was carried out to try to identify grower practices that led to good or poor disease outcomes. A number of elements/practices on the surveyed blocks were reviewed including vineyard location, canopy management, rootstock, clone, harvest date, powdery mildew and leaf roller control and use of bird netting. An analysis of spray diaries also took place examining spray intervals, spray volumes, timing and use of different products.

The survey identified a number of issues or practices that could have led to poor disease outcomes. These varied from vineyard to vineyard with no one practice leading to loss of control. A set of 'best management' guidelines was developed to help remind growers of the key components of good botrytis control.

The following are best management guidelines for botrytis control in grapes:

Canopy

- Ensure your canopy is open to make sure it dries out quickly after wet periods, thereby reducing potential time for infection to occur.
- Manage canopies to provide an open fruit zone for spray application and sunlight interception as shading promotes a thinner berry cuticle increasing fruit susceptibility to botrytis.

Bunches

- Aim to produce small open bunches in a non-congested fruit zone, as tight and congested bunches create a microclimate favourable to botrytis, have more contact points between berries leading to rubbing (flawed epicuticular wax) and are difficult for sprays to penetrate.

Injury

- Since botrytis preferentially infects damaged or dying tissue, growers need to identify practices that damage bunches and eliminate them. For example, controlling pests, such as leaf roller, and pathogens such as powdery mildew may assist botrytis management.

Nutrition

- Monitor nutritional status, particularly nitrogen levels, with petiole analyses; in particular, minimise nitrogen inputs where possible and maximise calcium content of plant tissues through four foliar applications between fruit set and veraison.

Spraying

- Calibrate/set up vineyard sprayer and monitor spray deposit in order to deliver a lethal chemical dose to flowers and bunches.
- Apply botryticides pre-infection through the use of infection period forecasting.

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INTRODUCTION

Botrytis cinerea is present in all vineyards at a variable loading, but only results in damaging bunch rot epidemics when physiological and other triggers cause berry tissues to become susceptible. Weather conditions immediately pre-harvest in Hawke's Bay this past season were ideal for bunch rot epidemics.

The level of botrytis bunch rot varied among Hawke's Bay vineyards, suggesting that some management practices might provide better protection against botrytis under high disease pressure situations than others.

OBJECTIVES

This project aimed to identify practices that appeared to help limit the development of botrytis in Hawke's Bay vineyards in this season (2004-05) and subsequently to provide some grower best practice guidelines.

MATERIALS AND METHODS

GROWER SURVEY

In order to remove cultivar factors we focused the study solely on Chardonnay. In conjunction with Larry Morgan (Te Mata Estate), a grower survey form was developed and circulated to growers via the Hawke's Bay Grape Growers Association mailing list.

Completed surveys were faxed back to Peter Wood, with only 16 being received by the end of July, one of which was discarded as it was from a Gisborne grower. As this review of botrytis management practices in the Hawke's Bay needed to cover a minimum of 25 vineyard blocks (worst and best case blocks), clearly we required a much larger pool of responses. Therefore we made approaches to Allied Domecq (AD) and Villa Maria (VM). Three blocks were suppled by AD. We were fortunate to receive information on 20 blocks from Villa Maria and conducted useful interviews with key staff during the latter part of August.

A few late faxes arrived from individual growers during August, giving 44 completed survey forms from 26 different vineyards.

ANALYSIS OF GROWER SURVEYS AND INTERVIEWS WITH SELECTED VINEYARDS.

The survey forms were well filled out with the vast majority providing clear responses to the following questions:

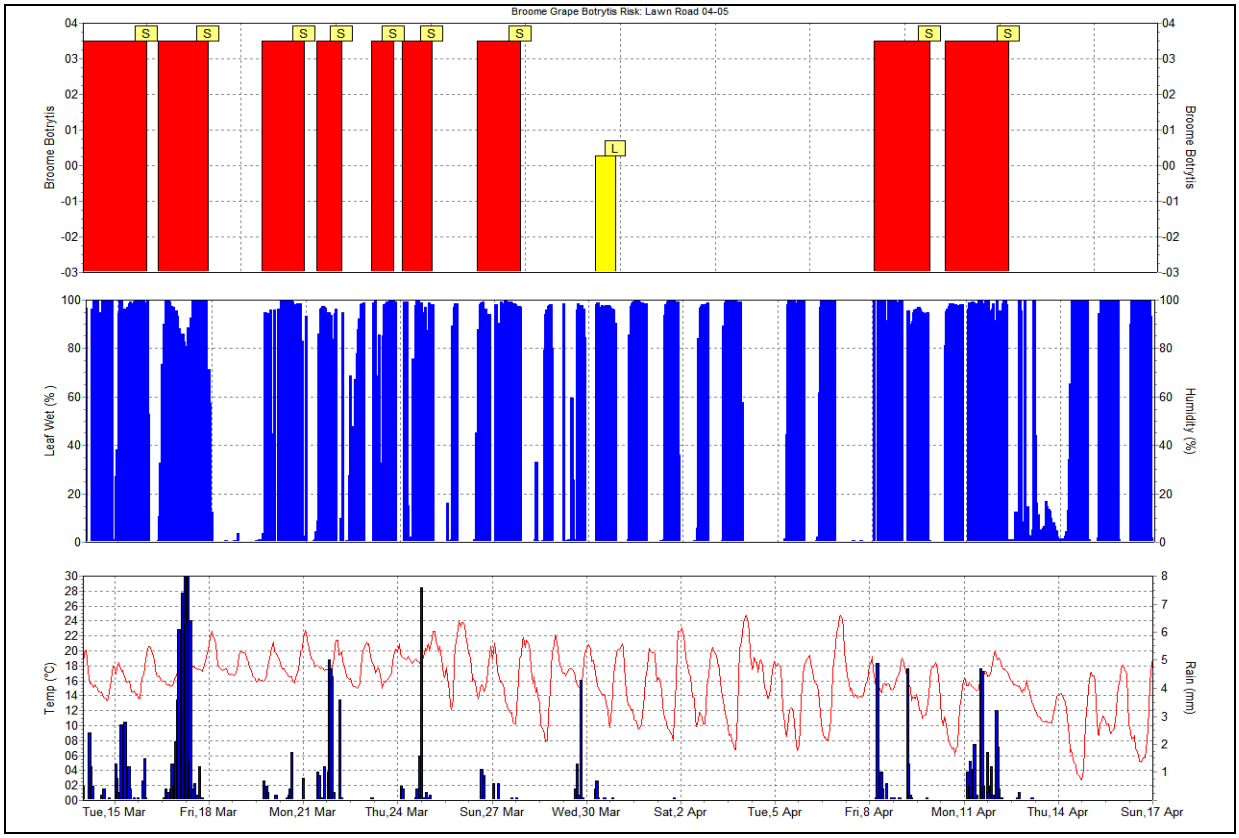
- Vineyard name, size and location
- Clone and rootstock used
- Canopy density (dense, moderate or open)
- Vintage date and Brix at vintage
- Was bird netting used
- Sprayer type and volume applied per ha
- Botryticide used at 5% and 80% capful
- Botryticide used at pre bunch closure (PBC) and verasion-pre-vintage
- Botryticide and insecticide used at any other timings
- Foliar calcium and/or tonic-like products applied
- Botrytis, powdery mildew and leaf roller control scores (poor, moderate, good, very good or excellent).

Survey responses were entered into a database, summaries were made and participants identified who covered the spectrum from extremely poor through to extremely good botrytis control in the 2004/05 season. We identified 3 blocks with poor botrytis control, 9 with moderate control, 10 with good, 15 with very good and 7 with excellent control. Because of the low numbers in each category, we decided to group the ‘poor’ with the ‘moderate control’, and the ‘very good’ with the ‘excellent control’ for further analysis.

RESULTS AND DISCUSSION

Vineyard location and vintage dates

Vineyard location was not identified as a key factor influencing botrytis control, although those in the Roy's Hill area tended to show lower levels of botrytis. When vintage date was considered, early harvest blocks (15 – 19 March), which were picked before the bulk of the rain (14 – 31 March, Figure 1), had better botrytis control (Figure 2). Such an observation also fits well with the results from Roy's Hill.



Botrytis cinerea infection periods indicated in the Broome Botrytis model above are:

- L (yellow bar) for light infection period.
- S (red bar) for severe infection period.

Figure 1. Metwatch graphs of botrytis infection periods and weather during vintage 2005 in Hawke's Bay.

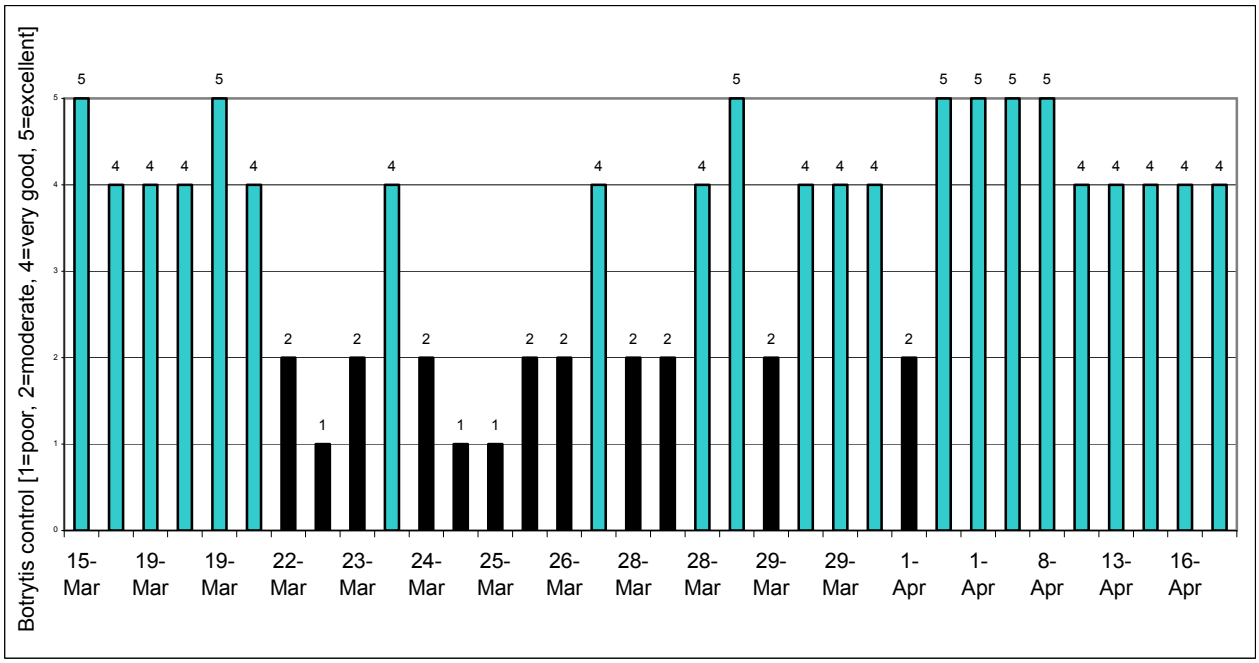


Figure 2. Botrytis control scores and vintage dates in Hawke's Bay 2005.

Clone and Rootstock

Clone was not identified as an important factor in botrytis control (Figure 3). The entire range of control, from poor to excellent, was found in Mendoza, UCD 6 and UCD 15 blocks. Consistent with other studies, there was an indication that B95 presented the grower with the greatest challenge. Rootstock did not present as a significant botrytis-inducing factor; an outcome likely due to widespread adoption of leaf plucking negating detrimental canopy effects of higher vigour rootstocks. There were 16 blocks on 101-14, 16 on S04, 8 on 3309 and 4 on Schwarzmann.

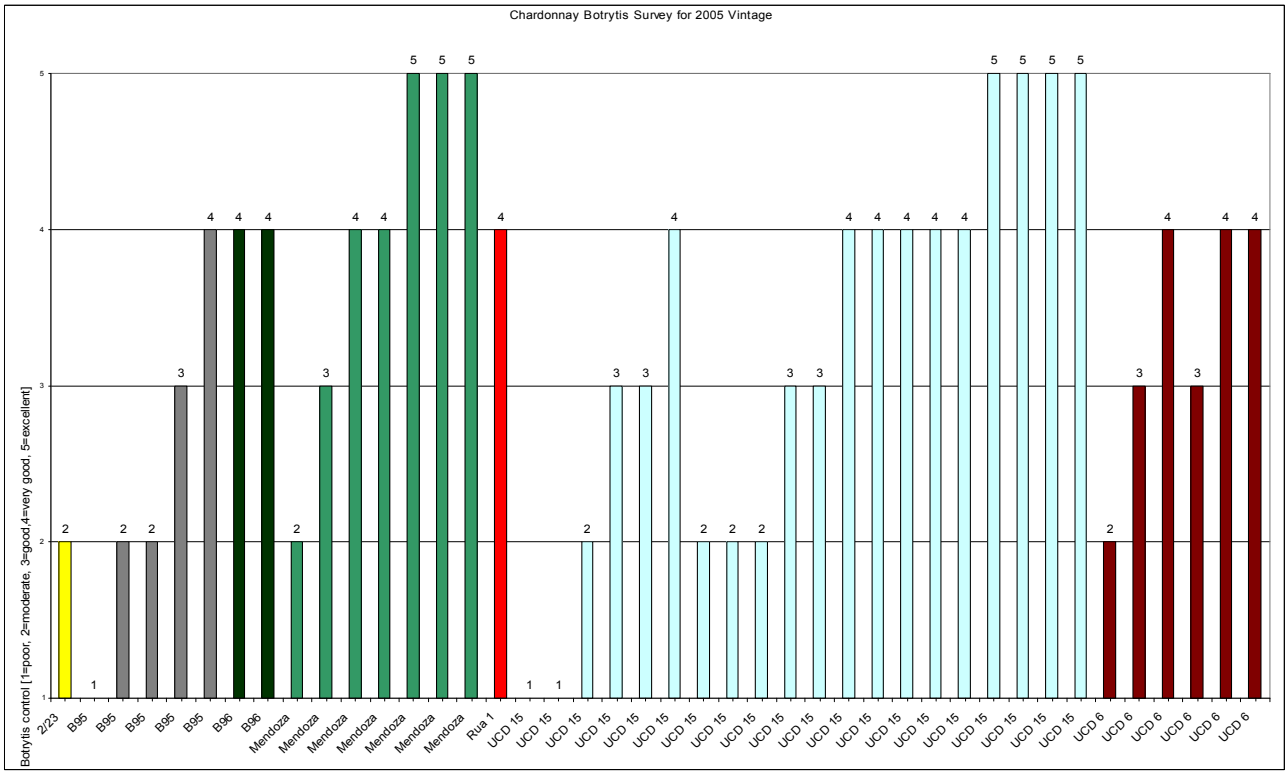


Figure 3. Botrytis control and Chardonnay clone in Hawke's Bay 2005.

Canopy management including trellis system, leaf plucking, bird netting

Bird netting was used on all but two blocks of the 44 studied, so a valid assessment of the effect of netting was not possible. There was comment by VM staff that a few blocks were still using "over the row" nets and that these were associated with increased botrytis.

Open canopies were associated with better botrytis control, and wider row spacings were seen to be beneficial. For example 70% of those blocks described with open canopies were scored as having very good – excellent botrytis control, where as only 17% of those blocks with non-open canopies were scored as having very good – excellent botrytis control.

Calcium and use of tonic-like products

The use of these products, as listed on the returned survey forms, was minor (20% applied calcium and only 7% applied tonic-like products). These products did not appear to be beneficial to botrytis control, although we caution that 1; the sample size (resulting from few growers using these products) was too low to allow an accurate indication, and 2; those who applied calcium usually only applied 1-2 applications whereas four applications are recommended.

Botryticide usage, spray volumes, powdery mildew and leaf roller control

Surprisingly, there was a negative relationship between fungicide usage and botrytis control, with those showing poor control using on average one more botryticide per block than those with very good to excellent control (Figure 4). The higher usage appears to have arisen, in part, because Botrytis was problematic late season and growers were applying further sprays (but too late to be effective) in an attempt to get it under control. For example most of the Rovral® applications were made in late March after 7-10 days of rain.

Botrytis Control	Botryticides	Percentages of growers used the following Botryticides							
	per block	Shirlan®	Euparen® Multi	Switch®	captan	Bravo®	Teldor®	Scala®	Rovral®
Poor-moderate control	4.2	50	42	100	0	50	75	33	67
V. good-excellent control	3.2	18	50	82	32	0	68	64	9

Figure 4. Summary of Botryticide Usage in Hawke's Bay Chardonnay, 2004-05.

No relationship between the level of powdery mildew or leaf roller control and botrytis levels at vintage existed, suggesting that powdery mildew and leaf roller were not contributing to botrytis in a significant manner in the blocks surveyed.

Spraying volume rates or sprayer type used did not have a bearing on the success of Botrytis control. For example, excellent control was achieved in blocks using low (160 litres per hectare) and those applying high volumes at 1000 litres per hectare. (Figure 5).

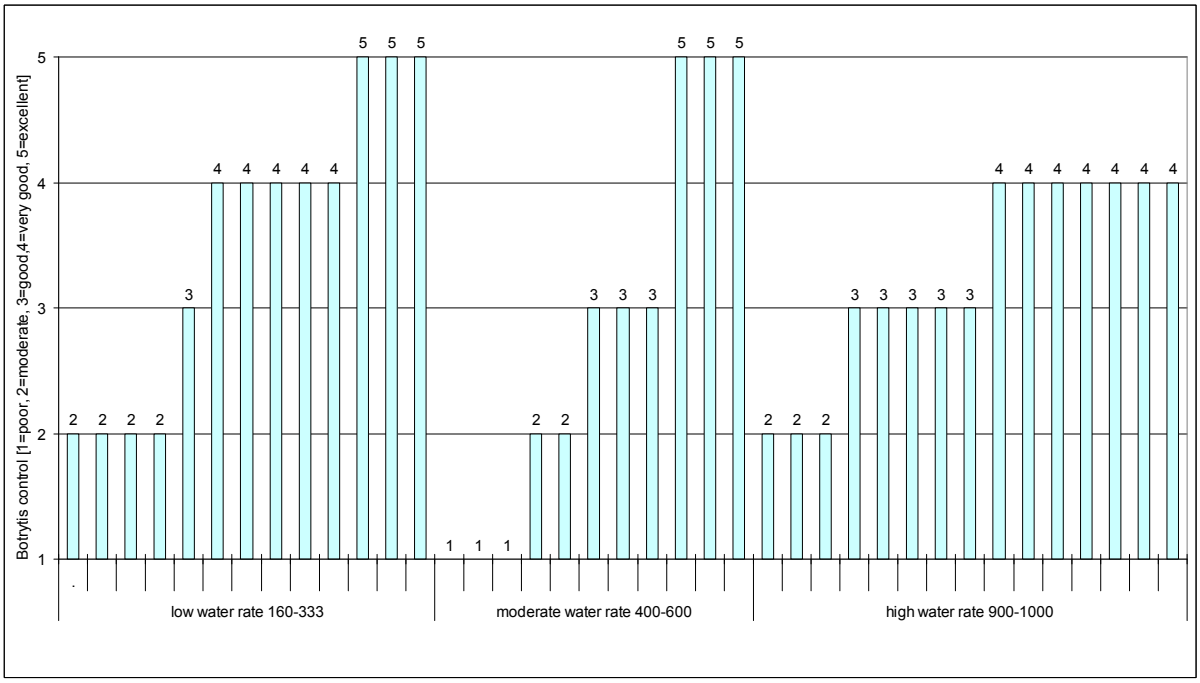


Figure 5. Botrytis control and water rates in Hawke's Bay Chardonnay, 2004-05.

Block-specific contributing issues

Participant interviews identified block-specific reasons for the level of botrytis control achieved. For example, a block infected with Grapevine leaf roll virus had low levels of rot because of virus-induced delayed fruit maturity during the high infection periods in March. A block of clone UCD15 had very poor fruit set and the resultant "chicken" berries were highly susceptible when the mid March rains arrived, leading to poor botrytis control. Another vineyard block (4-cane) had higher yields and lower maturity (8 April vintage) than the adjacent 2-cane pruned block (28 March vintage), and consequently the 4-cane block was less susceptible to *Botrytis cinerea*.

ANALYSIS OF HAWKE'S BAY SPRAY DIARIES

Full spray diaries were collected for each of the blocks surveyed and entered into a database for analysis.

Spray application intervals

Spray application intervals did not appear to be a factor in botrytis control, with poor performing blocks having shorter spray intervals than good performing blocks because of their higher use of botryticides. The average spray interval for poor to moderate performing

blocks was 19 days compared with 25 days for very good to excellent performing blocks. However, there was a trend for better performing blocks to have shorter spray intervals over the flowering period, which could have decreased latent infections occurring over this time.

Spray application timing

Weather data gathered from weather stations around Hawke's Bay showed a significant variation in the number, severity and length of botrytis infection periods depending on location (Appendix 1). For example, Roy's Hill weather station had a total of 8 severe infection periods from 1 November to 15 April while Longlands weather station had 21.

Examining the spray diaries in relation to the infection period data showed that sprays on poor performing blocks were not well timed in relation to infection periods for their locality, especially early in the season. There were periods where severe infection risk occurred during flowering and blocks were left unprotected because spray intervals longer than desirable over this period. Previous research has shown that infection over flowering is an important part of the botrytis infection cycle and can lead to latent infections in the fruit. Therefore, it is important to protect the grapevine over this period with regular sprays to ensure these infections are kept to a minimum.

OTHER RESEARCH ON BOTRYTIS MANAGEMENT

Nutrition

Research from overseas has shown that nutrition may have a role to play in botrytis management. Research results from other fruit crops, such as pipfruit and stonefruit, show that susceptibility to disease is influenced by plant nutrition, particularly the balance between nitrogen and calcium. Calcium has been associated with low levels of postharvest disease in several fruit crops (Chardonnet *et al*., 1999). It is believed that calcium helps to strengthen the cell walls of plant tissue, making them more resistant to fungal attack. Calcium additions may also result in the development of less compact bunches, a factor known to influence botrytis levels. In grapes, calcium accumulates predominantly in the leaves, with bunches containing only very low levels of calcium (Conradie, 1981). Applying foliar calcium sprays has been shown to increase the calcium content of grape berries and reduce the incidence and severity of botrytis bunch rot (Winter and Nicol, 1998).

Spray application

In order to have good chemical or biological control of botrytis, sprays need to be correctly targeted to the canopy to ensure good coverage and application of optimum doses. There is evidence from trials in Australia that the application of sublethal chemical doses may actually increase the amount of botrytis at harvest compared with unsprayed bunches (Warren and Riches, 2001). It is thought that this may be because chemical sprays kill or inhibit other microflora on the berry, which normally suppress or compete with botrytis, or alternatively because of damage to the berry skin, or a combination of factors. A trial using commercial spray equipment in Australia showed that 67% of bunches had residues lower than that required to kill 50% of botrytis infection.

The timing of spray applications during bunch development also has an effect on the efficacy of spray programmes. Tate (1994) reported that the best efficacy was achieved when chemicals were applied pre-infection.

BEST PRACTICE GUIDELINES

Like all good disease management, control should be focused on integrating a number of different practices rather than just relying on one particular method. Good disease control requires a combination of vineyard management, vine nutrition and targeted chemical/biological applications. The following points summarise the crucial factors that need consideration for the successful management of botrytis.

Canopy

- Ensure your vineyard canopy is open to make sure it dries out quickly after wet periods, thereby reducing potential time for infection to occur.
- Manage canopies to provide an open fruit zone for spray application and sunlight interception, as shading promotes a thinner berry cuticle increasing fruit susceptibility.

Bunches

- Aim to produce small open bunches in a non-congested fruit zone, as tight and congested bunches create a microclimate favourable to botrytis, have more contact points between berries leading to flawed epicuticular wax and are difficult for sprays to penetrate.

Injury

- Since botrytis preferentially infects damaged or dying tissue, growers need to identify practices that damage bunches and eliminate these. For example, controlling berry/bunch damaging pests such as leaf roller and pathogens such as powdery mildew may assist botrytis management.

Nutrition

- Monitor nutritional status with petiole analyses; in particular, minimise nitrogen inputs where possible and maximise calcium content of plant tissues through four foliar applications of calcium chloride between fruit set and veraison.

Spraying

- Calibrate and set up your sprayer and then monitor its performance with spray papers in order to deliver a lethal chemical dose to flowers and bunches.
- Schedule botryticides through the use of infection period forecasting to achieve pre-infection applications.

ACKNOWLEDGEMENTS

We would like to thank all survey respondents and in particular Villa Maria.

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APPENDIX 1: Botrytis Infection Periods At Weather Stations Around Hawke's Bay From November 2004 To April 2005.

(Red = severe, blue = moderate, yellow = low).

	Roys Hill	Havelock	Puketapu	Bay View	Lawn Rd	Longlands	Pakowhai
1/11/2003							
2/11/2003							
3/11/2003							
4/11/2003							
5/11/2003							
6/11/2003							
7/11/2003							
8/11/2003							
9/11/2003							Low
10/11/2003							
11/11/2003				Severe			Severe
12/11/2003				Severe			
13/11/2003			Moderate	Severe	Low	Moderate	Low
14/11/2003							
15/11/2003							
16/11/2003							
17/11/2003							
18/11/2003				Low			
19/11/2003							
20/11/2003				Low			
21/11/2003							
22/11/2003							
23/11/2003							
24/11/2003							
25/11/2003		Severe	Severe	Severe			
26/11/2003		Severe	Severe	Severe	Severe	Severe	
27/11/2003							
28/11/2003							
29/11/2003							
30/11/2003							
1/12/2003							
2/12/2003							
3/12/2003							
4/12/2003							
5/12/2003				Severe			
6/12/2003							
7/12/2003		Severe					
8/12/2003		Severe			Severe		
9/12/2003				Severe			
10/12/2003							
11/12/2003					Severe		
12/12/2003							
13/12/2003							
14/12/2003							
15/12/2003							
16/12/2003			Severe		Severe	Severe	Severe
17/12/2003		Severe			Severe		Severe
18/12/2003							
19/12/2003							
20/12/2003				Severe		Severe	
21/12/2003						Severe	
22/12/2003							
23/12/2003			Moderate		Severe		
24/12/2003			Severe			Severe	
25/12/2003						Severe	Severe
26/12/2003				Severe		Severe	Severe
27/12/2003							
28/12/2003							
29/12/2003	Low						
30/12/2003			Low		Moderate	Moderate	Moderate
31/12/2003				Moderate			

Appendix 1: continued

	Roys Hill	Havelock	Puketapu	Bay View	Lawn Rd	Longlands	Pakowhai
1/01/2004				Severe		Severe	Severe
2/01/2004							
3/01/2004							
4/01/2004						Severe	
5/01/2004						Moderate	
6/01/2004							
7/01/2004	Low	Low				Low	
8/01/2004			Low	Low		Low	
9/01/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
10/01/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
11/01/2004							
12/01/2004							
13/01/2004						Moderate	
14/01/2004							
15/01/2004							
16/01/2004							
17/01/2004							
18/01/2004							
19/01/2004							
20/01/2004							
21/01/2004						Low	
22/01/2004							
23/01/2004							
24/01/2004						Moderate	
25/01/2004						Severe	
26/01/2004				Low		Moderate	
27/01/2004							
28/01/2004							
29/01/2004							
30/01/2004							
31/01/2004	Low	Severe	Severe	Severe	Severe	Severe	Severe
1/02/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
2/02/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
3/02/2004	Low	Low	Low		Moderate	Moderate	Low
4/02/2004	Moderate		Moderate	Severe		Moderate	Low
5/02/2004			Moderate	Severe		Low	Moderate
6/02/2004							
7/02/2004						Severe	Low
8/02/2004						Severe	
9/02/2004						Severe	Low
10/02/2004				Moderate		Severe	Low
11/02/2004	Low	Low	Low	Low	Low	Low	Low
12/02/2004		Moderate	Moderate	Severe	Moderate	Moderate	Moderate
13/02/2004							
14/02/2004					Severe	Low	
15/02/2004							
16/02/2004							
17/02/2004							
18/02/2004						Moderate	
19/02/2004							
20/02/2004							
21/02/2004							Moderate
22/02/2004							
23/02/2004							
24/02/2004			Low	Moderate	Low	Severe	
25/02/2004				Low		Moderate	
26/02/2004	Moderate	Low		Low	Low	Severe	
27/02/2004		Moderate	Low	Moderate	Moderate	Severe	Moderate
28/02/2004							
29/02/2004							

Appendix 1: continued

	Roys Hill	Havelock	Puketapu	Bay View	Lawn Rd	Longlands	Pakowhai
1/03/2004							
2/03/2004							
3/03/2004							
4/03/2004						Low	
5/03/2004							
6/03/2004						Low	
7/03/2004							
8/03/2004							
9/03/2004							
10/03/2004							
11/03/2004	Severe		Severe			Severe	
12/03/2004			Severe			Severe	
13/03/2004						Severe	Severe
14/03/2004			Severe		Severe	Severe	Severe
15/03/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
16/03/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
17/03/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
18/03/2004	Severe	Severe	Severe	Severe	Severe	Severe	Severe
19/03/2004						Severe	
20/03/2004				Severe	Severe	Severe	Severe
21/03/2004	Severe			Severe	Severe	Severe	Severe
22/03/2004	Severe	Low		Severe	Severe	Severe	Severe
23/03/2004				Severe	Severe		Severe
24/03/2004		Moderate		Severe	Severe		Severe
25/03/2004				Severe	Severe	Low	Severe
26/03/2004							
27/03/2004	Severe	Severe			Severe	Low	Severe
28/03/2004	Severe	Severe		Severe	Severe	Severe	Severe
29/03/2004				Severe	Severe		
30/03/2004				Severe	Severe		
31/03/2004		Low		Severe	Low		Low
1/04/2004							
2/04/2004							
3/04/2004							
4/04/2004							
5/04/2004							
6/04/2004							
7/04/2004							
8/04/2004		Severe			Severe	Severe	Severe
9/04/2004	Low	Severe		Moderate	Severe	Severe	Severe
10/04/2004		Severe		Low	Severe	Severe	Severe
11/04/2004	Severe	Severe			Severe	Severe	Severe
12/04/2004		Severe			Severe	Severe	Severe
13/04/2004						Severe	Severe
14/04/2004							
15/04/2004							