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Effect of Organic, Biodynamic and Conventional Vineyard Management
Inputs on Grapevine Growth and Susceptibility to Powdery Mildew and
Botrytis Bunch Rot

By

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Thesis submitted to the School of Agriculture, Food and Wine
of The University of Adelaide

in fulfilment of the requirements for the degree of

Master of Agricultural Science

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Effect of Organic, Biodynamic and Conventional Vineyard Management Inputs on Grapevine Growth and Susceptibility to Powdery Mildew and Botrytis Bunch Rot.

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Contents

List of Tables.....	5
List of Figures.....	5
Abstract.....	6
Declaration.....	8
Journal of Papers Published as part of this Research.....	9
Acknowledgements.....	10
Conference Proceedings.....	11
Abbreviations.....	12
Chapter 1: Introduction.....	13
1.1 Objectives of the Research.....	15
1.2 Linking Statement.....	15
Chapter 2: Literature Review.....	17
2.1 Significance of powdery mildew, Botrytis bunch rot and Organic Agriculture.....	17
2.2 Disease epidemiology.....	20
2.2.1 Botrytis bunch rot.....	21
2.2.2. Powdery mildew.....	23
2.3 Susceptibility to diseases.....	25
2.4 Resistance.....	26
2.4.1 Natural resistance.....	26
2.4.2 Induced Resistance.....	27
2.5 Management systems.....	29
2.5.1 Conventional viticulture.....	29
2.5.2 Organic Viticulture.....	30
2.5.3 Biodynamic viticulture.....	31
2.6 Nutrition.....	34
2.7 Management options.....	35
2.7.1 Canopy.....	36
2.7.2 Fungicides.....	36
2.7.3 Fertilisers, compost and mulches.....	37
2.7.4 Foliar options- salts, bacterial, extracts and teas.....	38
2.7.5 Biodynamic perspective.....	40
2.7.6 Considerations.....	41
2.8 Summary.....	42
Chapter 3. Prepared Manuscript: Assessment and comparison of biodynamic inputs in the control of powdery mildew.....	44
Chapter 4. Prepared Manuscript: Biodynamic and Organic vineyard management, a comparison of the control of powdery mildew and effects on selected vine growth measures in Cabernet Sauvignon.....	98

Chapter 5. Botrytis bunch rot.....	114
5.1 Introduction	114
5.2 Materials and Methods.....	114
5.2.1 Waite Campus field trial.....	115
5.2.2 Waite Campus growth room trial	115
5.2.3 McLaren Vale trial.....	115
5.2.4 Botrytis inoculation and assessment	116
5.2.5 Statistical analysis	117
5.3 Results and discussion	117
5.3.1 Botrytis bunch rot severity on bunches: Waite Campus Field Trial.....	117
5.3.2 Botrytis bunch rot severity on bunches: Growth Room Trial.....	119
5.3.3 Botrytis bunch rot severity on bunches: McLaren Vale Trial.....	119
5.4 Summary	120
Chapter 6: General Discussion	127
Literature Cited (Chapter 1, Literature Review, Chapter 5 and General Discussion).....	133
Appendices	150

List of Tables

Table 2-1: Average industry-wide economic impact of Botrytis and other bunch rots by climatic zone.....	19
Table 5-1: Treatment program applied to <i>Vitis vinifera</i> cvs Chardonnay and Shiraz, Waite Campus field trial; 2010-2011.....	121
Table 5-2: Treatment program applied to <i>Vitis vinifera</i> cvs Chardonnay and Shiraz, Waite Campus growth room trial: winter 2012.....	122
Table 5-3: Treatment program applied to <i>Vitis vinifera</i> cvs Cabernet Sauvignon, McLaren Vale trial 2010-2013.	123
Table 5-4: Effect of biodynamic (BD) and organic (OG) foliar treatments on the mean severity score of Botrytis bunch rot on grape bunches following moist incubation, compared with water (CON) control and conventional inputs (CV). Waite Campus trial 2012/13.	124
Table 5-5: Effect of herbal extracts ^{fl} both individually and combined, on the severity of Botrytis bunch rot on grapevine bunches following moist incubation, cvs Chardonnay and Shiraz, compared with synthetic fungicides and a water control. Growth room trial 2012.....	125
Table 5-6: The effect of Biodynamic (BD), high input conventional (HIC), low input conventional (LIC) and organic (OG) treatments with (+) and without (-) compost, on the severity of Botrytis bunch rot (following moist incubation) in Cabernet Sauvignon, McLaren Vale, SA.	126

List of Figures

Figure 2-1: Botrytis bunch rot disease cycle (from New York State Agricultural Experiment Station, 2010).....	22
Figure 2-2: Powdery mildew disease cycle (from Pearson, 1988).....	24

Abstract

Interest and uptake of organic agriculture (including biodynamics) has continued to increase with 37.5 million ha of agricultural land dedicated to these systems worldwide (IFOAM, 2014). Whilst the use of organic inputs and systems in vineyards is becoming increasingly better researched and reported, little reliable research exists for the same in biodynamic viticulture; especially in regard to disease control. It is claimed that using biodynamic inputs can control powdery mildew and Botrytis bunch rot, two of the more economically important diseases in Australian viticulture. This study investigates the efficacy of these inputs, compared with those used in organic and conventional approaches.

To this end three trials were established in 2010 in South Australia; two pot trials at the University of Adelaide Waite Campus, Urrbrae, Australia and the third in a commercial Cabernet Sauvignon vineyard in the McLaren Vale wine region, Australia. At the Waite trial site six treatments (2 organic, 2 biodynamic, 3 conventional and 1 control) were applied to a split plot design. Each treatment was replicated in three blocks, on three vines per treatment, to newly propagated cultivars of Chardonnay and Shiraz vines (*Vitis vinifera* L.). The same cultivars and a similar split plot design were used in a growth room trial in the winter of 2012. Four treatments of recommended herbal extract 'teas' from the biodynamic literature (Yarrow, Nettle, Equisetum and a combination of all three) and two controls (water and synthetic chemicals) replicated four times, were applied. In McLaren Vale an established trial site was utilised. Four treatments (organic, biodynamic, high input conventional and low input conventional) were applied to 20 year old Cabernet Sauvignon vines in a randomised split plot design replicated in four blocks. To assess the effect of compost, each management treatment was also separated to include both a plus and minus compost treatment.

Non-destructive assessment of powdery mildew severity was evaluated over three seasons at the Waite trial and Botrytis severity data via detached bunch assay were collected in the final season. Additionally selected growth data were also recorded; including nutritional status at flowering, harvest and mean bunch and berry weights, cane length and pruning weights to measure the effect on growth. Similar sets

of data were recorded in the McLaren Vale site. Severity of powdery mildew and Botrytis bunch rot data only were collected from the growth room trial.

In the wet and humid conditions of 2010-11, disease severity was high, in both field trials, across most treatments and the results were largely inconclusive. From the remaining two seasons in the field trials, the effects of the inputs on disease severity followed a consistent pattern in most situations. In the potted trial, plant extracts exhibited effective early season control of powdery mildew and reduced severity of Botrytis. In the McLaren Vale site, powdery mildew was found in only one of three years and the study of Botrytis was inconclusive. In both field trials, plant growth parameters suggested that conventionally grown vines were generally larger and more productive than those grown organically or biodynamically. The growth room trial suggested an acceptable level of powdery mildew control in response to a combined plant extract application when compared with conventional inputs.

Encouraging results from this trial would suggest benefits in the use of some BD extracts, but further field testing will be required. This study is the first study to compare biodynamic disease control inputs with the well-established conventional and increasingly accepted organic options. As some sections of the Australian Winegrape industry seek alternative disease control inputs, the biodynamic preparations examined here may be a viable option to augment established practices.

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any University or any other tertiary institution and, to the best of my knowledge and belief contains no material previously published or written by another person, except where due reference has been made in the text.

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Benjamin PA Pike

Date

Journal of Papers Published as part of this Research

B.P.A. PIKE, E.S. SCOTT, C. PENFOLD and C. COLLINS (2014)

Assessment and comparison of biodynamic inputs in the control of powdery mildew

Presented in Chapter 3

B.P.A. PIKE, E.S. SCOTT, C. PENFOLD and C. COLLINS (2014)

Biodynamic and organic vineyard management, a comparison of the control of powdery mildew and effects on vine growth measures in Cabernet Sauvignon

Presented in Chapter 4

Each of these manuscripts is displayed in the thesis in either published or submitted form according to the instructions to author of the specific journal

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Conference Proceedings

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The effect of organic, biodynamic and conventional vineyard management inputs on growth and susceptibility of grapevines to powdery mildew. In poster proceedings; 15th Australian Wine Industry Technical Conference, 14-18th July, 2015, Sydney, Australia

Pike B.P.A., Scott, E.S., Penfold C. and Collins C.

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Abbreviations

AGWA	Australian Grape and Wine Authority
AUD	Australian Dollars
BAA	Biodynamic Agriculture Australia Pty. Ltd.
BD	Biodynamic
BOM	Bureau of Meteorology
CV	Conventional
DA	Department of Agriculture (Australian Quarantine Inspection Service)
DPI:NSW	Department of Primary Industries: New South Wales
HIC	High Input Conventional
IPM	Integrated Pest Management
IFOAM	International Federation of Organic Agriculture Movements
LIC	Low Input Conventional
OG	Organic
PR	Pathogenesis Related
NASAA	National Association of Sustainable Agriculture in Australia
SAR	Systemic Acquired Resistance
SARDI	South Australian Research and Development Institute
US	United States of America