



**Ornamental and weed potential of**  
***Acacia baileyana* F. Muell:**  
**Investigations of fertility and leaf colour**

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**B.Sc. (Hons)**

Submitted in fulfillment of the requirements for the degree of

**Doctor of Philosophy**

Discipline of Wine and Horticulture

School of Agriculture and Wine

Faculty of Sciences

The University of Adelaide

September 2003

# Table of Contents

<b>Abstract</b> .....	<b>i</b>
<b>Declaration</b> .....	<b>iii</b>
<b>Acknowledgements</b> .....	<b>iv</b>
<b>List of Tables</b> .....	<b>vi</b>
<b>List of Figures</b> .....	<b>x</b>
<b>List of Plates</b> .....	<b>xiii</b>
<b>Chapter One: General Introduction</b> .....	<b>1</b>
1.1 <i>Acacia</i> .....	1
1.2 <i>Acacia baileyana</i> .....	2
1.2.1 Weed status of <i>Acacia baileyana</i> .....	3
1.2.2 Ornamental status of <i>Acacia baileyana</i> .....	4
1.3 Thesis Objectives .....	5
<b>Chapter Two: Literature Review</b> .....	<b>7</b>
2.1 Fertility .....	7
2.1.1 Factors affecting seed production .....	7
2.1.1.1 Number of flowers .....	7
2.1.1.2 Breeding systems .....	9
2.1.1.3 Pollinators .....	11
2.1.1.4 Predation .....	12
2.1.1.5 Resources and environmental conditions .....	12
2.2 Environmental weeds .....	13
2.2.1 <i>Acacia</i> species as weeds .....	14
2.3 Leaf colour .....	15
2.3.1 Anthocyanins .....	16
2.3.2 Flavonoid pathway to anthocyanin biosynthesis .....	17
2.3.3 Colour stabilising and intensifying effects .....	19
2.3.4 Environmental and abiotic factors regulating anthocyanin accumulation .....	20
2.3.5 Function of leaf anthocyanins .....	21
2.3.6 Genes involved in biosynthesis of anthocyanins .....	23

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2.3.7 Inheritance of leaf colour .....	25
2.4 Conclusions .....	26
<b>Chapter Three: Environmental control of bud formation and flowering of clonal</b>	
<i>Acacia baileyana</i> .....	28
3.1 Introduction .....	28
3.2 Materials and methods .....	29
3.2.1 Plant material .....	29
3.2.2 Propagation of stem cuttings .....	30
3.2.3 Experimental treatments .....	33
3.2.4 Measurements .....	34
3.3 Results .....	36
3.3.1 Success of cutting propagation .....	36
3.3.2 Bud formation .....	36
3.3.3 Floral development .....	36
3.3.4 Anthesis .....	36
3.4 Discussion .....	38
<b>Chapter Four: Breeding system, reproductive efficiency and weed potential of</b>	
<i>Acacia baileyana</i> .....	41
4.1 Introduction .....	41
4.2 Materials and methods .....	42
4.2.1 Plant material .....	42
4.2.2 Growth and timing of first flowering .....	42
4.2.3 Investigation of breeding systems using controlled pollinations .....	45
4.2.4 Natural reproductive output .....	49
4.2.4.1 Weed plants .....	49
4.2.4.2 Comparison of weed and cultivated plants .....	50
4.2.4.3 Comparison of purple and green leaf forms .....	50
4.2.5 Statistical analysis .....	50
4.3 Results .....	51
4.3.1 Growth and timing of first flowering .....	51
4.3.2 Investigations of breeding systems using controlled pollinations .....	52
4.3.3 Natural reproductive output .....	52
4.3.3.1 Weed plants .....	52

4.3.3.2 Comparison of weed and cultivated plants .....	52
4.3.3.3 Comparison of purple and green leaf forms .....	57
4.4 Discussion .....	57
4.4.1 Breeding systems .....	57
4.4.2 Natural reproductive output .....	61
4.4.3 Flower and seed production .....	64
4.4.4 Differences between plants .....	64
4.4.5 Weed status .....	64
4.4.6 Efficiency of reproduction .....	65
<b>Chapter Five: Using digital image analysis to estimate flower numbers of <i>Acacia</i></b>	
<b><i>baileyana</i> and hence determine seed production and weed potential .....</b>	<b>66</b>
5.1 Introduction .....	66
5.2 Materials and methods .....	67
5.2.1 Tree selection .....	67
5.2.2 Digital images .....	67
5.2.3 Proportion of yellow flowers .....	69
5.2.4 Canopy volume .....	69
5.2.5 Flower counts .....	69
5.2.6 Total pod and seed production .....	72
5.2.7 Relationship between density of flowers and proportion of yellow .....	72
5.2.8 Predicted total flower number .....	73
5.2.9 Standard error .....	73
5.2.10 Differences between trees .....	74
5.3 Results.....	74
5.4 Discussion.....	75
<b>Chapter Six: Development of HPLC methods for analysis of leaf anthocyanins .....</b>	<b>83</b>
6.1 Introduction .....	83
6.2 Development of HPLC methods .....	85
6.2.1 Leaf tissue extraction method .....	85
6.2.1.1 Plant material .....	85
6.2.1.2 Extraction of pigments .....	85
6.2.2 HPLC method .....	85
6.2.3 Optimisation of methods .....	86

6.2.3.1 Trial 1 – Concentration of leaf extracts .....	86
6.2.3.2 Trial 2 – Storage of leaves at -80°C prior to extraction .....	87
6.2.3.3 Trial 3 – Concentration of extract and subsequent dilution with Buffer A prior to HPLC .....	90
6.2.3.4 Trial 4 – Estimation of efficiency of anthocyanin extraction from leaf tissue .....	93
6.2.3.5 Trial 5 – Manipulation of HPLC solvent gradient conditions .....	97
6.2.3.6 Trial 6 – Manipulation of HPLC gradient conditions and temperature of chromatography column .....	98
6.3 Discussion .....	100
 <b>Chapter Seven: Purification and identification of anthocyanins from <i>Acacia</i> and <i>Banksia</i> species using high voltage paper electrophoresis .....</b>	
7.1 Introduction .....	104
7.2 Materials and methods .....	105
7.2.1 Plant material .....	105
7.2.2 Extraction of pigments .....	107
7.2.3 High voltage paper electrophoresis (HVPE) .....	107
7.2.4 HPLC analysis .....	107
7.2.5 Liquid chromatography-ionspray mass spectrometry (LC-MS) .....	107
7.2.6 Sugar analysis .....	108
7.3 Results .....	108
7.4 Discussion .....	113
 <b>Chapter Eight: Development and validation of four colour categories to assess leaf colour .....</b>	
8.1 Introduction .....	115
8.2 Materials and methods .....	116
8.2.1 Definition of the colour categories .....	116
8.2.2 Colour meter .....	116
8.2.2.1 Plant material .....	116
8.2.2.2 Colour meter .....	117
8.2.2.3 Comparison of the colour categories with the colour meter .....	117
8.2.3 HPLC-determined anthocyanin content .....	117
8.2.3.1 Plant material .....	117

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8.2.3.2	Extraction of colour pigments and HPLC-determined anthocyanin content .....	119
8.2.3.3	Comparison of the colour categories with HPLC-determined anthocyanin content .....	119
8.3	Results .....	122
8.3.1	Colour meter .....	122
8.3.2	HPLC-determined anthocyanin content .....	122
8.3.2.1	Plants grown from cuttings .....	122
8.3.2.2	Plantation trees .....	125
8.4	Discussion .....	126
 <b>Chapter Nine: Anthocyanin expression and inheritance of <i>Acacia baileyana</i> purple leaf colour .....</b>		
9.1	Introduction .....	133
9.2	Materials and methods .....	134
9.2.1	Assessment of leaf colour .....	134
9.2.2	Expression of leaf colour .....	135
9.2.2.1	Plants outside (plantation) .....	135
9.2.2.2	Plants in modified temperature environments .....	135
9.2.3	Inheritance of the purple leaf colour .....	136
9.2.3.1	1995 crosses .....	136
9.2.3.2	1996 crosses .....	137
9.2.3.3	Statistical analysis .....	137
9.3	Results .....	138
9.3.1	Expression of leaf colour .....	138
9.3.1.1	Plants outside (plantation) .....	138
9.3.1.2	Plants in modified temperature environments .....	138
9.3.2	Inheritance of the purple leaf colour .....	143
9.4	Discussion .....	143
9.4.1	Expression of leaf colour .....	143
9.4.2	Inheritance of purple leaf colour .....	147
 <b>Chapter Ten: General Discussion .....</b>		
<b>151</b>		

<b>Bibliography</b> .....	158
<b>Appendix 1: Discriminant analysis method and HPLC-determined anthocyanin content</b> data from Chapter 8 .....	173
<b>Appendix 2: Environmental data and 1995 cross pollination results referred to</b> in Chapter 9 .....	180
<b>Appendix 3: Published papers</b> .....	183

## Abstract

*Acacia baileyana* F. Muell., is endemic to the Cootamundra region of New South Wales, Australia. It is a widely planted ornamental tree that produces attractive displays of yellow inflorescences. There are two main types, the typical green leaf form and a recently cultivated purple leaf form, variety *purpurea*. Outside its endemic range, the green leaf form has become a weed. The aim of this study was to develop an understanding of the fertility and leaf colour of *A. baileyana* in order to determine its weed potential, and to provide a basis for the commercial development of the species for its foliage, cut flowers and as an indoor flowering pot plant.

The purple colour of the leaves is due to anthocyanin pigments. To characterise the type of anthocyanins in leaf tissue, efficient extraction, separation (reverse-phase HPLC), purification and identification techniques were developed. Rapid purification and identification was achieved using high voltage paper electrophoresis in conjunction with mass spectrometry. The two main anthocyanin compounds of variety *purpurea* identified were delphinidin-3-glucoside and cyanidin-3-glucoside.

Leaf colour is a quantitative trait that was reliably assessed with a grading scale using four colour categories. Each category reflected the anthocyanin content of the tissue. Anthocyanin accumulation in the juvenile leaves was strongly induced at low temperature and at high light intensity. Intense purple leaves were produced only at temperatures below a mean of 21°C maximum and 12°C minimum when plants were grown outside, or at a constant 13°C day and 9°C night temperature when plants were grown in controlled environment rooms. The green foliage trait was found to be dominant over purple leaf colour.

*Acacia baileyana* required warm temperatures (above 18°C maximum, 13°C minimum) for bud formation and cool temperatures (below 16°C maximum, 9°C minimum) for flowering. Peak flowering was advanced by four months by controlling the time when plants were exposed to warm then cool temperatures. Double the number of plants flowered under these conditions compared with outside grown plants.

Both the green and purple leaf forms had similar reproductive strategies. They are highly self incompatible, have rapid growth and flower by two years of age. Controlled cross pollinations produced an average pod set of 23%, which was much greater than for self pollination (0.36%) and open pollination (less than 0.41%). Under natural conditions, total seed production was high due to the large number of flowers. A novel method using digital image analysis was developed to estimate flower numbers. Maximum flower number for a two-year old plant was 334,808, resulting in 8,007 seeds. For mature trees, flower numbers ranged from 1.25 to 13.2 million, with maximum seed number



of 19,559. Therefore, precocity and high flower numbers may partly explain the weed status of *A. baileyana*. The recessive purple leaf trait may explain why only the green leaf form has been recorded as a weed. However, given the obvious weed potential of the species, any commercialisation of *A. baileyana* should include a strategy to prevent its spread into the surrounding environment.