

UNIVERSITY OF SOUTHERN QUEENSLAND

DIVERSITY OF FUNGAL ENDOPHYTES IN THE SEMI EVERGREEN VINE  
THICKETS OF THE SOUTHERN BRIGALOW BELT BIOREGION AND THEIR  
PRODUCTION OF ANTIMICROBIAL SECONDARY METABOLITES

**A dissertation submitted by**

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## Abstract

Endophytes are thought to make up at least half of the diversity within the fungal kingdom and yet they remain one of the least explored functional groups. What research that has been conducted has focused on tropical rainforests or grasses with comparatively little research examining diversity within other ecosystems. Semi-evergreen vine thickets (SEVT) are remnant dry rainforests which form part of the Brigalow Belt along the eastern coast of Australia. Due to the fertile soil on which they grow, SEVT are frequently cleared for agricultural use, currently no information exists regarding fungi within this ecosystem.

Leaves from 23 plants at 3 sites of SEVT were sampled and fungal endophytes were isolated and identified. Fungal specificity was examined by collecting leaves from 22 *Geijera salicifolia* plants from 5 sites of SEVT. In total, 228 and 187 fungal endophytes were isolated from the two studies. Multi-gene phylogenetic analysis was further conducted on *Nigrospora*, *Preussia*, *Guignardia* and Pezizales - four of the most commonly occurring taxa. Endophytes obtained from the diversity study were screened for antimicrobial capabilities and HPLC analysis was conducted on crude extracts obtained from endophytes showing bioactivity. Pure compounds were retested for their ability to inhibit the growth of microbial pathogens.

A wealth of novel fungal endophytes was observed within SEVT. Four new taxa within the predominately saprotrophic order Pezizales, were observed. This finding may represent an example of ecosystem specificity. A large number of *Preussia*, *Nigrospora* and *Guignardia* species were also observed. Fungal specificity was found

to be occurring between several species of *Guignardia* and *G. salicifolia*. 6 novel pure compounds were isolated from a *Preussia* sp. Three of these showed significant antimicrobial activity against MRSA and *C. albicans*. The results of this study indicate that SEVT harbour a vast storehouse of novel and medicinally significant endophytic fungi.

## Publications

List of publications arising from this project:

Graham, R and Dearnaley J.D.W (2011) 'Biodiversity of fungal endophytes in semi-evergreen vine thickets'. XVI Congress of European Mycologists, Thessaloniki, Greece, 19-23 September 2011. Conference presentation.

Mapperson, R and Dearnaley J.D.W (2012) 'Biodiversity of fungal endophytes in semi-evergreen vine thickets'. Australasian Mycology Society, Cairns, Australia, 24-26 September 2012. Conference presentation

Mapperson, R, Kotiw, M, Davis, R.A and Dearnaley J.D.W (2013) 'The diversity and antimicrobial activity of *Preussia* sp. endophytes isolated from Australian dry rainforests.' *Current Microbiology* 68:30-37

Sutour, S, Mapperson, R, Dearnaley J.D.W, Kotiw, M, Kalaitzis, J, and Davis, R A (2013) 'Africanarones A-F: Antimicrobial  $\alpha$ -Pyrone Polyketides from the Australian Endophytic Fungus *Preussia aff. Africana*'. Manuscript in preparation.

## Certification of Dissertation

I certify that the ideas, experimental work, results, analyses, software and conclusions reported in this dissertation are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.

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*"For from Him and through Him and to Him are all things. To Him be glory forever.  
Amen."*

## Table of Contents

Abstract .....	i
Publications .....	iii
Certification of Dissertation .....	iv
Acknowledgements.....	v
Table of Contents .....	vi
List of Figures .....	ix
List of Tables.....	xi
List of Abbreviations .....	xiii
Problem statement .....	1
Research questions: .....	2
Ecology of fungal endophytes.....	2
Screening of fungal endophytes for antimicrobial compounds .....	3
Objectives .....	3
1 Literature review and Scope of project .....	3
1.1 Introduction.....	3
1.2 Fungal Endophytes .....	6
1.2.1 Definition and role of fungal endophytes in plants .....	6
1.2.2 Method of colonisation.....	9
1.2.3 Diversity.....	10
1.2.4 Molecular methods for identifying diversity .....	13
1.2.5 Secondary metabolites in fungal endophytes .....	16
1.3 Antibiotics.....	17
1.3.1 Historical context of antibiotic development .....	18
1.3.2 Methods of antibiotic function .....	19
1.3.3 Mechanisms of resistance.....	20
1.4 Semi-evergreen vine thickets of the Southern Brigalow Belt .....	20
2 Fungal endophyte diversity from plants within Semi Evergreen vine thickets....	21
2.1 Introduction.....	21
2.2 Aims .....	23
2.3 Methods .....	24

2.3.1	Sample collection and isolation .....	24
2.3.2	Fungal identification .....	27
2.3.3	DNA extraction .....	27
2.3.4	Sequencing of isolated DNA.....	28
2.3.5	Statistical analysis .....	29
2.4	Results .....	29
2.5	Discussion .....	40
2.6	Conclusion .....	50
3	Specificity of fungal endophytes from <i>Geijera salicifolia</i> in SEVT .....	51
3.1	Introduction.....	51
3.2	Aims.....	54
3.3	Methods .....	54
3.3.1	Sample collection .....	54
3.3.2	Fungal identification .....	56
3.3.3	DNA extraction.....	56
3.3.4	Sequencing of isolated DNA.....	58
3.3.5	Statistical analysis .....	58
3.4	Results .....	59
3.5	Discussion.....	73
3.6	Conclusions.....	80
4	Further taxonomic characterisation of endophytic taxa from SEVT .....	81
4.1	Introduction.....	81
4.2	Aims.....	85
4.3	Methods .....	85
4.3.1	Amplification and sequencing of isolated DNA .....	86
4.3.2	Phylogenetic analysis .....	87
4.4	Results .....	88
4.4.1	Phylogenetic characterisation of <i>Nigrospora</i> spp.....	88
4.4.2	Phylogenetic characterisation of <i>Preussia</i> spp. ....	94
4.4.3	Phylogenetic characterisation of <i>Guignardia</i> spp.....	102
4.4.4	Phylogenetic characterisation of Pezizales taxa .....	110

4.5	Discussion .....	117
4.5.1	Phylogenetic characterisation of the <i>Nigrospora</i> isolates.....	119
4.5.2	Phylogenetic characterisation of the <i>Preussia</i> isolates .....	119
4.5.3	Phylogenetic characterisation of <i>Guignardia</i> isolates .....	122
4.5.4	Phylogenetic characterisation of the Pezizales isolates .....	123
4.6	Conclusion .....	126
5	Antimicrobial activity of endophytes from SEVT .....	128
5.1	Introduction.....	128
5.2	Aims .....	130
5.3	Methods .....	131
5.3.1	Initial screening of endophytic isolates .....	131
5.3.2	Fractionation of crude extract .....	134
5.3.3	Testing of pure compounds .....	136
5.4	Results .....	137
5.4.1	Initial screening against endophytic isolates .....	137
5.4.2	Fractionation of crude extract .....	140
5.4.3	Semi preparative carbon HPLC analysis of isolates .....	142
5.5	Discussion .....	147
5.6	Conclusion .....	152
6	Conclusions and Future Directions .....	153
7	References .....	156
8	Appendices.....	186
8.1	Appendices A (Chapter 2).....	186
8.2	Appendices B (Chapter 3).....	196
8.3	Appendices C (Chapter 4).....	199
8.4	Appendices D (Chapter 5).....	203

## List of Figures

Figure 1 Sites of SEVT included in this study. Sampling occurred at locations marked in green .....	24
Figure 2. No significant differences were recorded for the number of fungal endophytes occurring in different canopy locations SE+/-.....	32
Figure 3 Isolate PAH2.7 after 6 months growth .....	40
Figure 4 Location of SEVT sampled in this study. Sites indicated in green.....	55
Figure 5 Example of the diverse culture characteristics of isolates classed as mycelia sterilia.....	60
Figure 6 Average number ( $\pm$ SE) of isolates collected per site and location within each site.....	61
Figure 7 The ITS regions of the nuclear rDNA used for fungal taxonomy purposes, including all three gene regions.....	83
Figure 8 Spore size of isolates of various morphotypes. Scale bar= 50 $\mu$ m. T=morphotype number.....	92
Figure 9 Neighbour-Joining phylogenetic tree of <i>Nigrospora</i> spp. ITS region with 1000 bootstrap support. ....	93
Figure 10 Multi-gene (ITS, LSU and $\beta$ -tubulin) Neighbour-Joining tree of <i>Preussia</i> spp. with 1000 bootstrap support. Red text indicates samples collected in this study while the red lines indicate clades.....	98
Figure 11 Morphological appearance of the same age cultures of <i>Preussia</i> spp. in clade 1. Scale bar = approximately 2cm.....	99
Figure 12 Morphological appearance of the same age cultures of <i>Preussia</i> spp. in clade 6. Scale bar = approximately 2.5cm .....	99
Figure 13 Neighbour-Joining tree of <i>Preussia</i> spp based on LSU sequences. Isolates from this study are in bold.....	100
Figure 14 Neighbour-Joining tree of <i>Preussia</i> spp based on beta tubulin sequences. Isolates from this study are in bold.....	101
Figure 15 Neighbour-Joining tree of the ITS region for <i>Guignardia</i> sp. Red lines and arrows indicate species groupings isolated in this study.....	108
Figure 16 Neighbour-Joining tree of the LSU region for <i>Guignardia</i> sp. ....	109

Figure 17 Morphological characteristics of three species of <i>Guignardia</i> . White scale bar=50µm. Red scale bar= 2cm. Yellow arrows indicate the black picnidia common to all <i>Guignardia</i> isolates. Red arrows indicate the characteristic flagella attached to spores while the green arrow indicates the mucilaginous sheath. ....	109
Figure 18 Phylogenetic tree of Sarcosomataceae and Sarcoscyphaceae. Red lines indicate possible new genera, blue lines indicate family groupings. Red arrow indicates the single individual which may represent a new genus .....	116
Figure 19 Morphological characteristics of the three potentially novel genera. Scale bar = approximately 1cm .....	117
Figure 20 Method of testing fungal endophytes, F= fungus Numbers represent different pathogens .....	132
Figure 21 Isolate PAL2.3 showing different HPLC traces when grown under the same conditions.....	140
Figure 22 Semi preparative Carbon HPLC trace of four isolates. Mode of culture incubation is indicated.....	143
Figure 23 HPLC traces of BSH2.9. Black arrow indicates lost peak and location of one pure compound, red arrows indicate regions where activity towards MRSA was detected .....	144
Figure 24 Semi preparative Carbon HPLC trace of BSH2.9 from the shaking and static culture methods respectively. Arrows indicate fractions from which pure compounds were obtained.....	145
Figure 25 Chemical structure of pure compound obtained from BSH2.9 using the shaking method of incubation. ....	145
Figure 26 Pure compounds obtained from isolate BSH2.9 using the static culture method.....	146
Figure C.27 Neighbour-Joining tree of the ITS region of all three families with 1000 bootstrap support. ....	202

## List of Tables

Table 1 Location and growth form of plants sampled .....	25
Table 2 Colonisation and isolation rates of endophytes collected from three sites. ...	30
Table 3 Frequency of fungal genera observed compared with the number of species present .....	33
Table 5 Closest GenBank match of the ITS region for all fungi successfully sequenced .....	34
Table 6 Endophytic fungi isolated from <i>G.salicifolia</i> with closest GenBank match where applicable.....	63
Table 7 Morphotypes of <i>Nigrospora</i> isolates and closest Genbank matches where applicable .....	89
Table 8 Host and closest GenBank matches of <i>Preussia</i> taxa isolated in this study ...	95
Table 9 Host and closest GenBank matches of <i>Guignardia</i> taxa isolated in this study .....	104
Table 10 Host and closest GenBank matches of Pezizales isolated in this study .....	112
Table 11. Results of initial screening test against nosocomial pathogens .....	138
Table 12 HPLC fractions showing bioactivity against MRSA and <i>C. albicans</i> .....	141
Table 13 Minimum inhibitory concentrations (MIC) for the three pure compounds tested against MRSA and <i>C. albicans</i> at various time intervals.....	146
Table A.14 List of all endophytic taxa isolated in the diversity study.....	186
Table A. 15 Raw data for testing differences between leaves with and without growth across the three sites (including samples believed to be over sterilised) .....	193
Table A.16 Raw data for testing differences between leaves with and without growth across the three sites (not including samples believed to be over sterilised).....	194
Table A.17 ANOVA of differences in fungal infection rates of fungi located high, mid and low in the canopy.....	195
Table B.18 T-Test of the sampling years .....	196
Table B.19 Univariate analysis of differences between fungi located high, mid and low in the canopy of <i>G. salicifolia</i> and compared across 5 sites .....	196

Table B. 20 Univariate analysis the 6 most commonly observed fungal genera of <i>G. salicifolia</i> across 5 sites. Statistically significant values are highlighted.....	196
Table C.21 GenBank Ascension codes for <i>Preussia</i> and <i>Guignardia</i> isolates .....	199
Table D. 22 ANOVA of fungi showing bioactivity across the three sites. ....	203
Table D.23 NMR data for non bioactive compound isolate from BSH2.9 .....	204
Table D.24 Well assays of three novel compounds at four different time intervals against <i>Candida albicans</i> .....	205
Table D.25 Well assays of three novel compounds at two different time intervals against MRSA .....	207

## List of Abbreviations

AGRF- Australian Genome Research Facility

C-endophytes- Clavicipitaceous Endophytes

CLSI- Clinical Laboratory Standards Institute

CR-Colonisation Rates

DERM- Department of Environment and Resource Management

EPBC- Environmental Protection and Biodiversity Conservation

ICN-International Code of Nomenclature

IR- Isolation Rates

ITS- Internal Transcribed Spacer

MBC- Minimum Bactericidal Concentration

MFC- Minimum Fungicidal Concentration

MIC-Minimum Inhibitory Concentration

NC-endophytes – Non Clavicipitaceous Endophytes

OTU- Operational Taxonomic Unit

PDA- Potato Dextrose Agar

SEVT- Semi Evergreen Vine Thickets