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**Chemical investigation of Aromatic and
Medicinal plants from the New Guinea highlands
and North Queensland**

Thesis submitted by

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in July 2009

for the degree of Master of Pharmacy

in the School of Pharmacy and Molecular Sciences

James Cook University of North Queensland

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Statement of the contribution of others

I, the undersigned author of this thesis, acknowledge the contribution of others to this work. Substantial supervision was provided by A/Prof. Bruce Bowden (School of Pharmacy and Molecular Sciences, JCU; primary supervision) and Prof. Beverley Glass (School of Pharmacy and Molecular Sciences, JCU; co-supervision). Editorial assistance in the preparation of this thesis was provided by A/Prof. Bruce Bowden.

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Abstract

Various aromatic and medicinal plant species from the New Guinea highlands and North Queensland were investigated to discover and characterise new molecular entities with useful pharmacological properties, which could potentially become lead compounds for the development of new drug products.

A new optically active diterpene ester was isolated from the plant species *Stylosanthes hamata* and its structure determined using spectroscopic technique (^1H , ^{13}C , HSQC, HMBC and COSY). It is the 3-hydroxy-3-methyl glutarate ester of cativol, a diterpene previously reported from *Halimium viscosum*. Some components of crude essential oil samples were identified without the need for separation of their mixture by the use of gradient selective NMR techniques. A total of twenty-six known compounds were identified by either this method or by separating and analysing the essential oils of various species from the New Guinea highlands and North Queensland. They included; monoterpenes, sesquiterpenes, acetate-derived metabolites such as the acetogenins/polyketides methyl salicylate and gibbilimbols, and shikimic acid-derived metabolites such as dillapiole and *trans*-anethole. Some of the minor components detected in one species were the same as major components in other essential oil samples and it is suspected that cross contamination may have occurred during the essential oil distillation in PNG. This problem will make publications of results difficult unless uncontaminated samples are available for comparison.

Cytotoxic and antimicrobial assays were performed on all essential oils and extracts.

Although some essential oil samples displayed cytotoxicity, the levels were considered too low to warrant further investigation. The antimicrobial assays employed included the use of six gram positive and six gram negative bacteria as well as one yeast and five fungi. The major components of the distillates that produced a large zone of inhibition in the initial screening were selected and retested against the microbes. All of the metabolites tested showed lower activity than the crude extracts. This may be due the presence of minor components in the distillates that have much greater activity or synergistic effects from other oil components.

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List of Abbreviations

1D	one dimensional
2D	two dimensional
ATCC	American Type Culture Collection
br	broad
CH ₃ CN	acetonitrile
CD	Circular Dichroism
CDCl ₃	deuterated chloroform
COSY	¹ H ¹ J-Correlated Spectroscopy
d	doublet
dd	double doublet
ddd	doublet of double doublets
ddt	doublet of double triplets
DEPT	Distortionless Enhancement by Polarisation Transfer
dt	double triplet
EtOAc	ethyl acetate
ESI	Electrospray Ionisation Mass Spectrometry
GC	Gas Chromatography
GC-MS	Gas Chromatography - Mass Spectrometry
hept	heptet
HMBC	Heteronuclear Multiple Bond Coherence
HSQC	Heteronuclear Single Quantum Correlation
HPLC	High Performance Liquid Chromatography

IR	Infrared
m	multiplet
MeOH	methanol
mult	multiplicity
MS	Mass Spectrometry
NMR	Nuclear Magnetic Resonance
PDA	photodiode-array
ppm	parts per million
s	singlet
sp.	species (singular)
spp.	species (plural)
t	triplet
td	triple doublet
TLC	Thin Layer Chromatography
TOCSY	Totally Correlated Spectroscopy
UV	ultraviolet
q	quartet