Leptospermum of Australia

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PhD Student Researcher

A bit of Background

- Part of the RIRDC project:

New Sources & Bioactivity of Australian *Leptospermum* Honeys

University of Sunshine Coast
- chemical tests (honey & nectar)
- fieldwork

University of Technology Sydney
- collection of honey and plant samples
- bioactivity tests
- sending results to beekeepers

University of Sydney
- antifungal tests

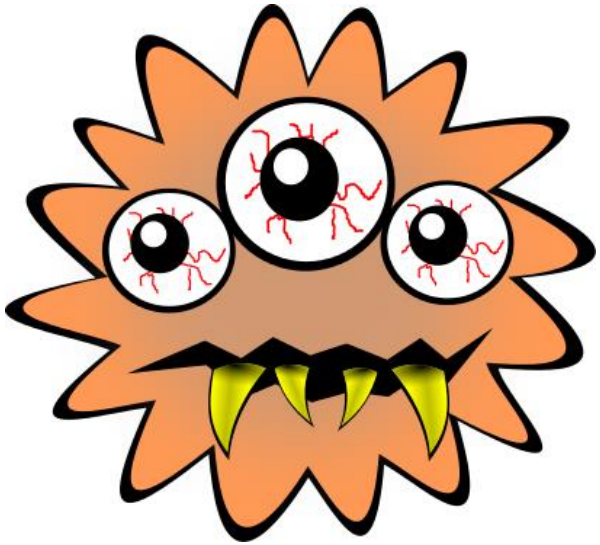
Why the interest in medicinal honey

Used as a medicine throughout history of human race

- wound dressing
- significant antimicrobial (germ-killing) activity
- fell from favour in 1940s → antibiotics discovered

Death by a thousand cuts

- High sugar content (~80%)
- Acidity (low pH)



- Hydrogen peroxide
  - from bee enzyme
  - e.g. jarrah, spotted gum
- **Floral factors**
  - **non-peroxide activity (NPA)**
    e.g. *Leptospermum* (manuka/jellybush) honey

Non-peroxide activity (NPA)

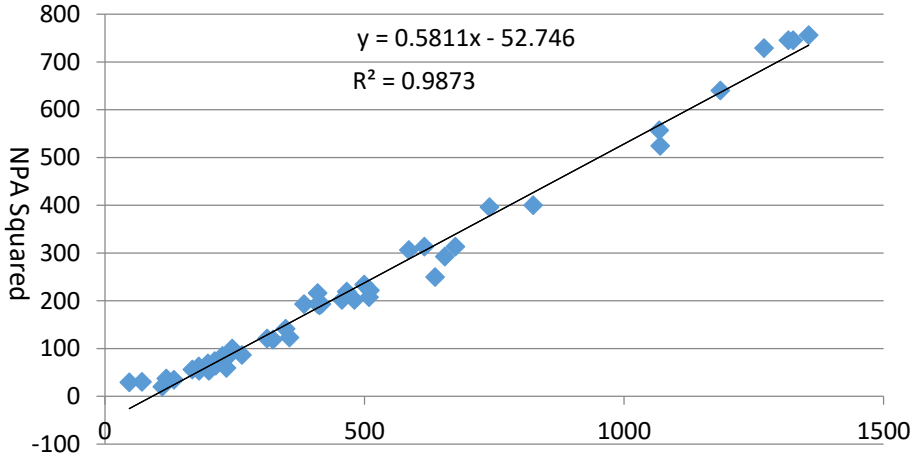
Very active, even after hydrogen peroxide removed

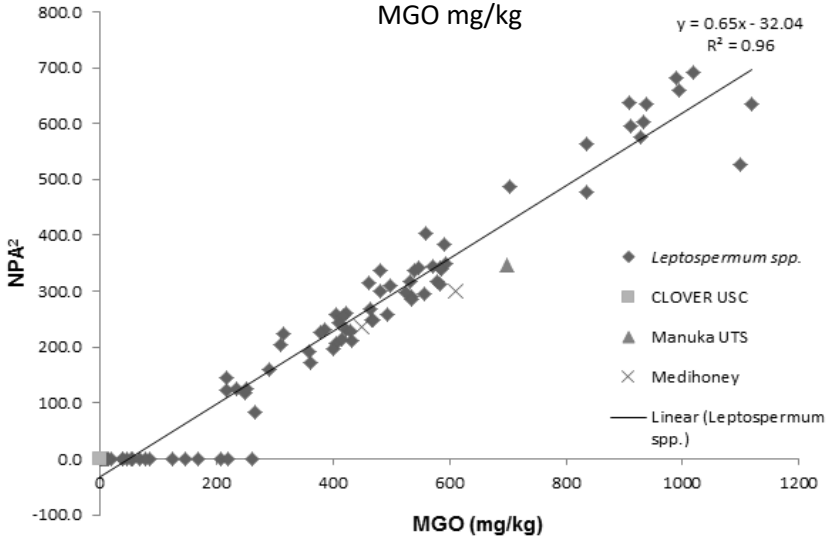
stable, can be sterilised, ideal for medicinal use

Most famous example:
***Leptospermum* honey from NZ and Aus**

manuka and jellybush

MGO is responsible for NPA / UMF





The anti-bacterial activity is due to MGO

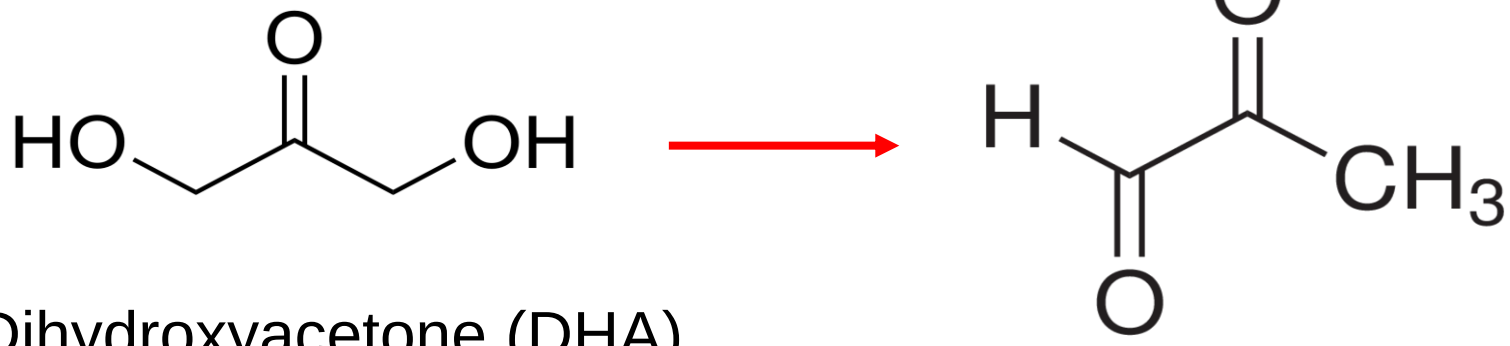
NZ data,
UMF/NPA squared vs MGO

Aust. Data, NPA squared vs MGO

NPA 5 = MGO 83 ppm
NPA 10 = MGO 260 ppm
NPA 15 = MGO 514ppm
NPA 20 = MGO 830 ppm

The MGO in Honeys is derived from DHA in Nectar.

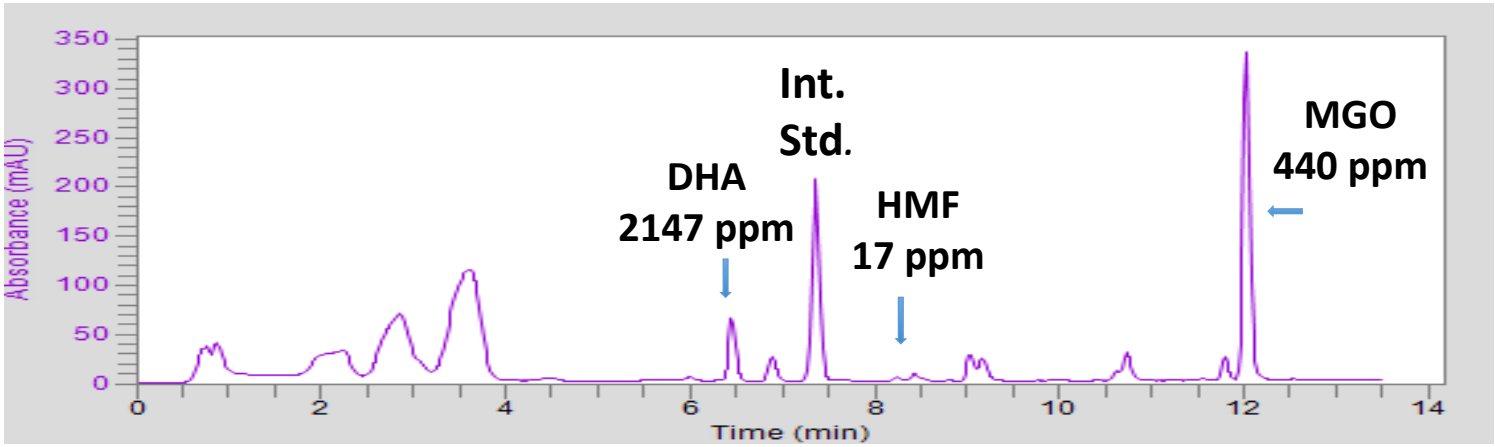
Young Honeys have High DHA and Low MGO



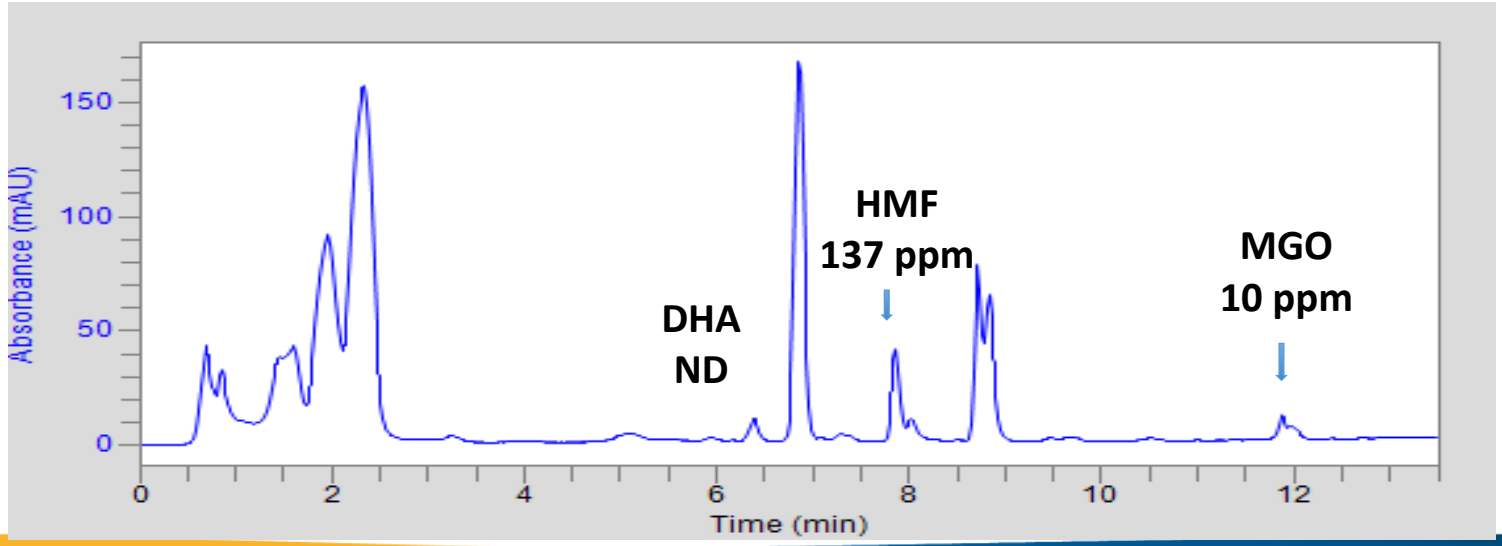
Dihydroxyacetone (DHA)

Methylglyoxal (MGO)

DHA, HMF & MGO in Honeys

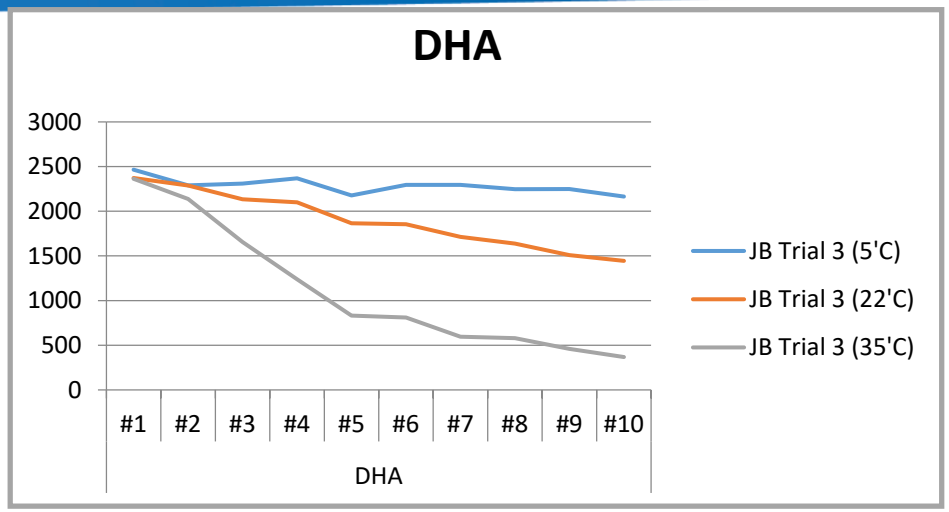


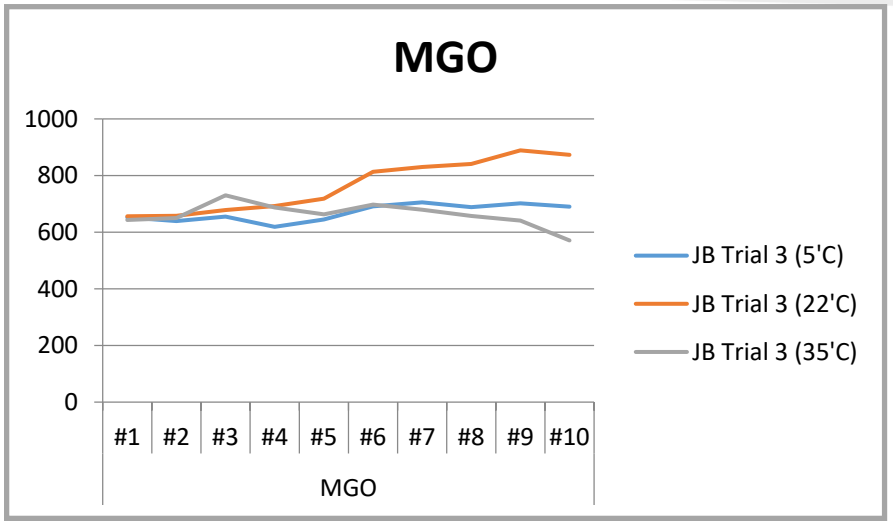
Active,
NPA 13

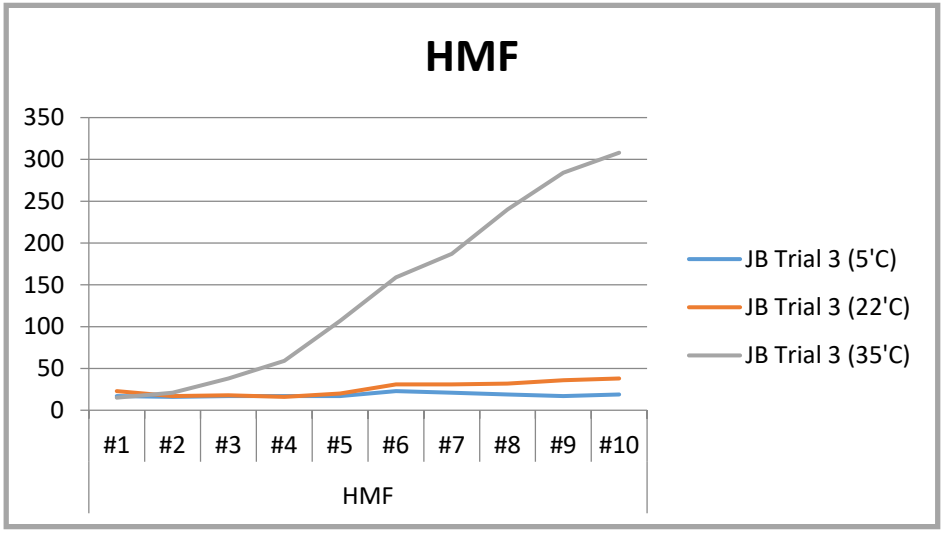


Inactive,
NPA zero

Maturing *Leptospermum* Honeys. 1.







Capilano Honey &
Univ. Sunshine Coast

Maturing *Leptospermum* Honeys.2.

What will my honey go in 6 – 12 months?

Ten young honeys;
Average: 1760 ppm DHA & 260 ppm MGO
Stored 12 months @ 22oC

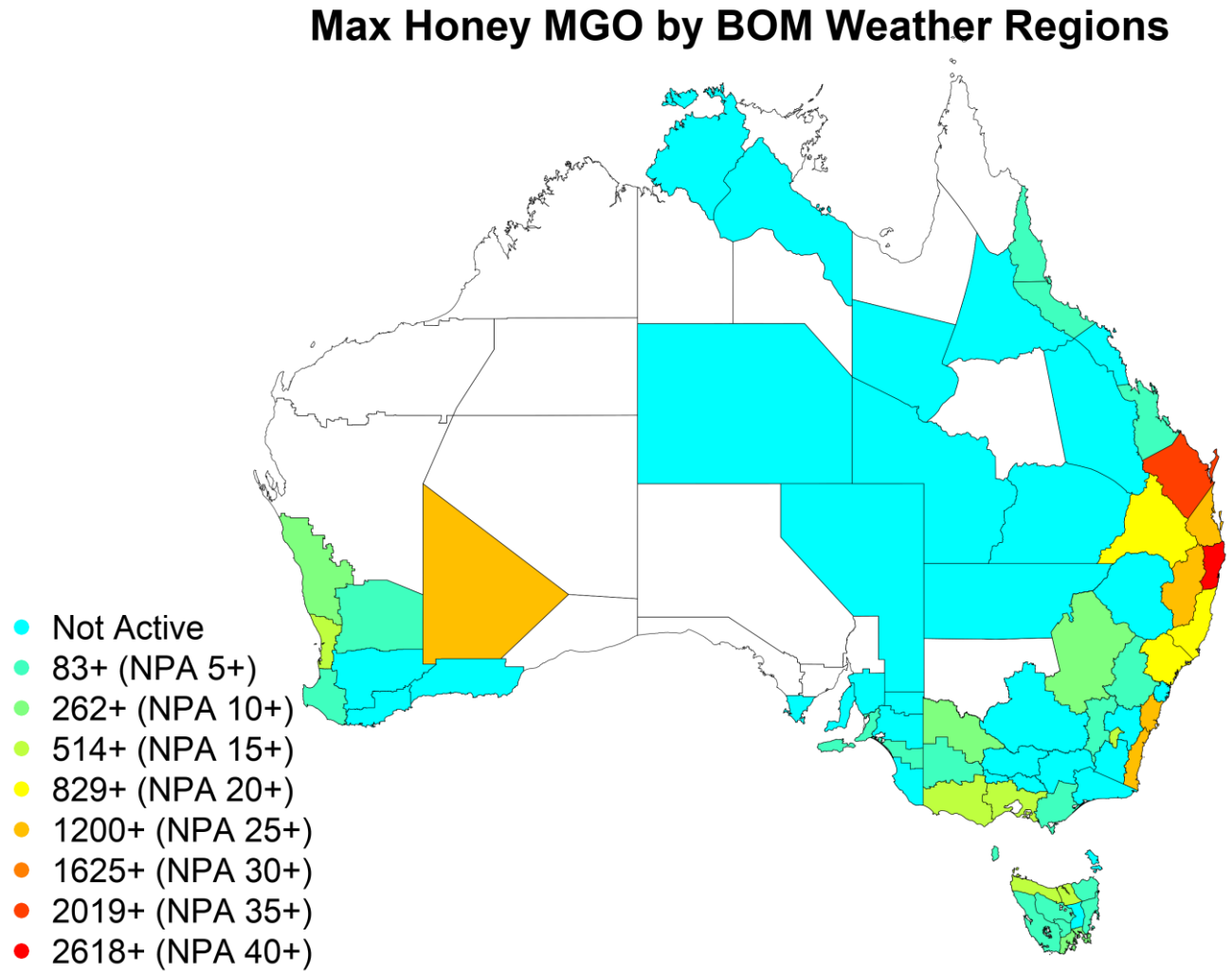
Average DHA loss 44% (range 33-52%)

Average MGO Conversion 40% (range 34-61%)

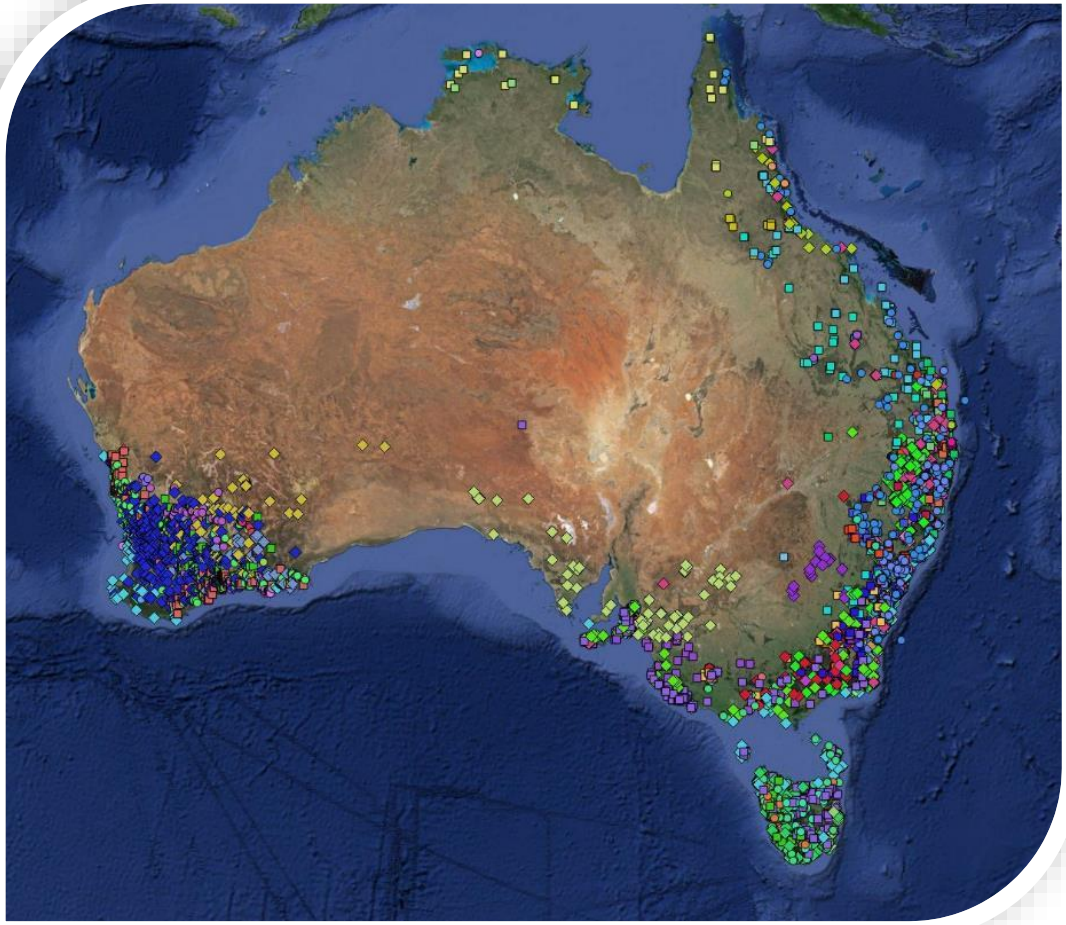
Final Average: 988 ppm DHA & 561 ppm MGO

Capilano Honey & Univ. Sunshine Coast

Leptospermum Honey Map

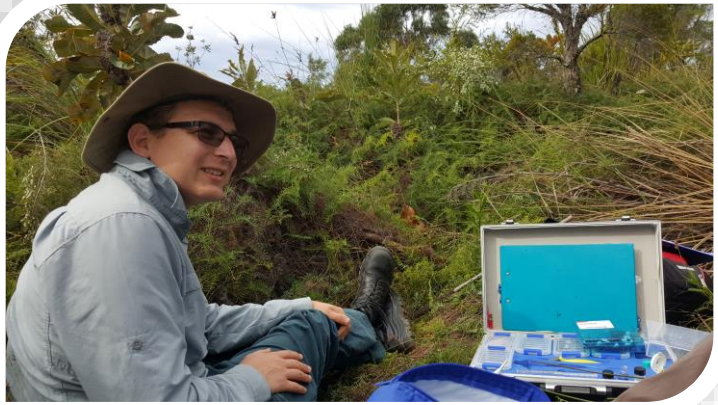


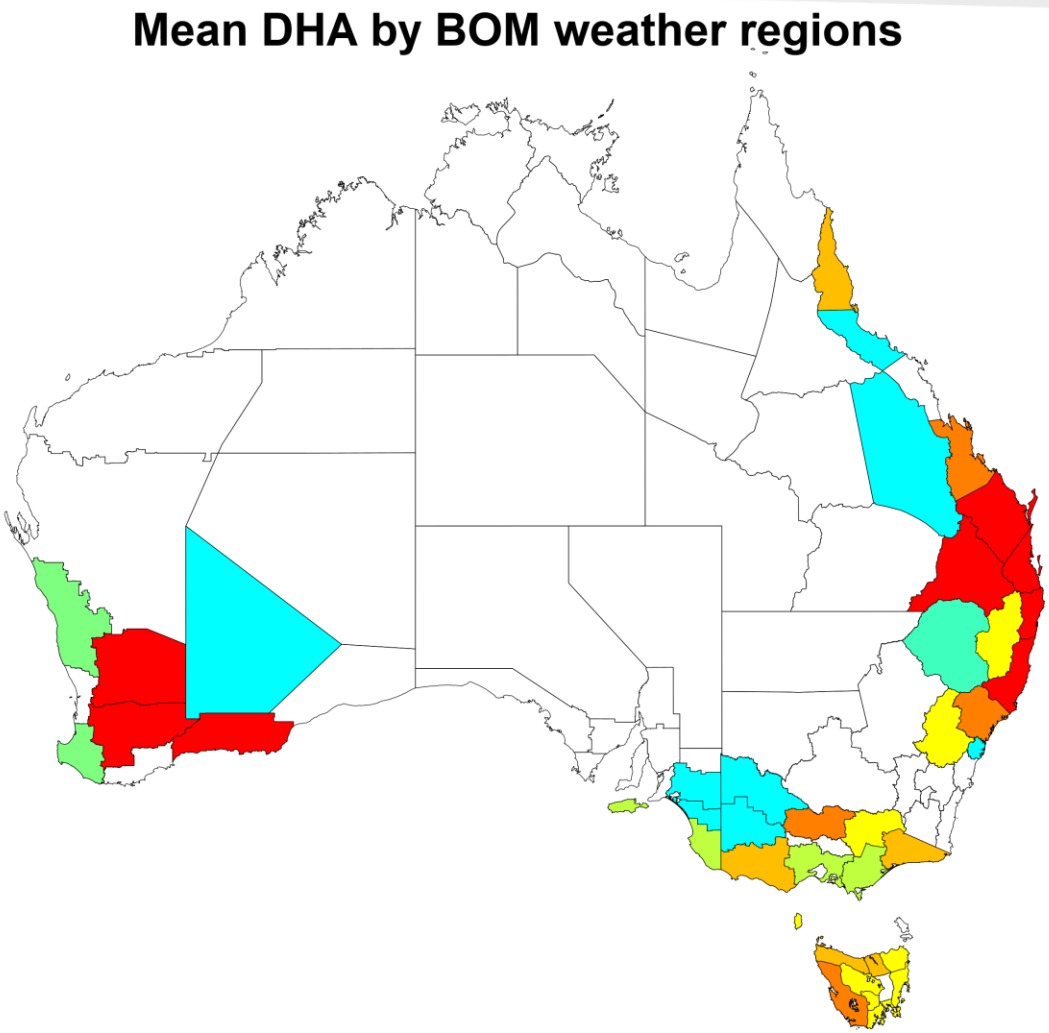
Leptospermum in Australia



- 87 Species
- 54 Tested

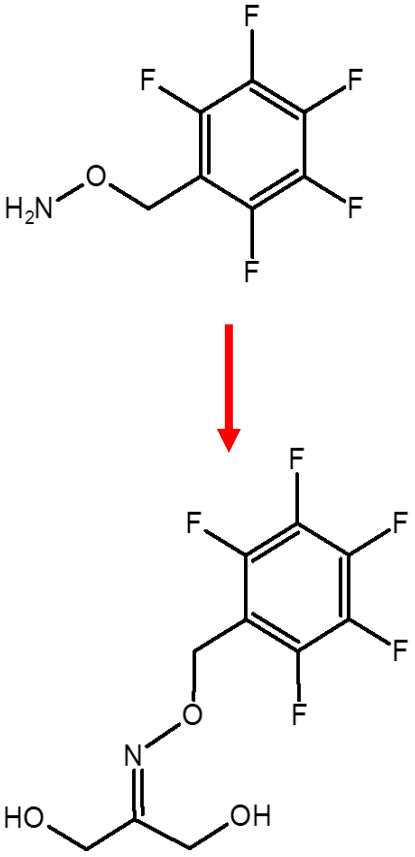
Nectar Field Work

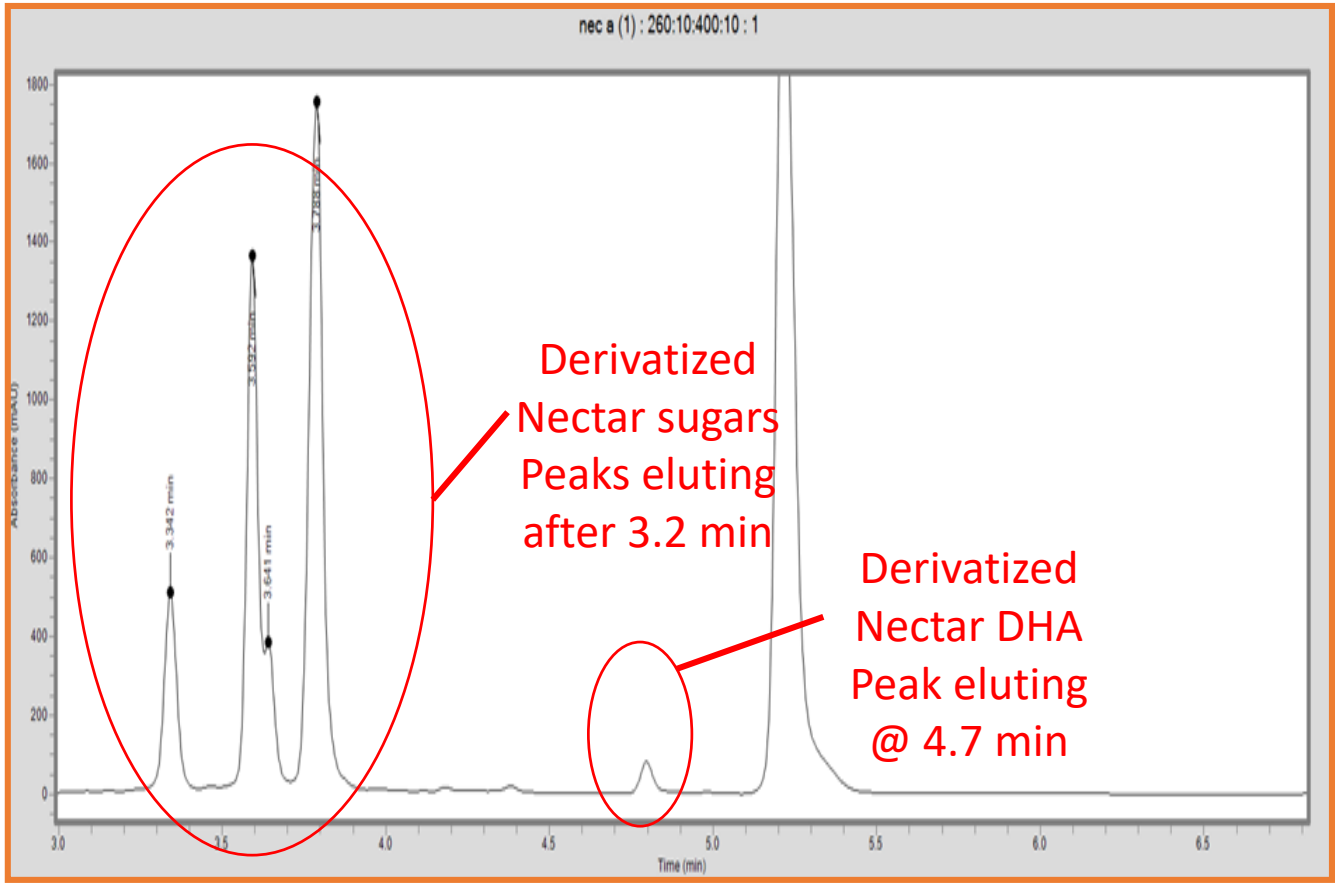




Testing the DHA activity in Nectar

Derivatisation of DHA

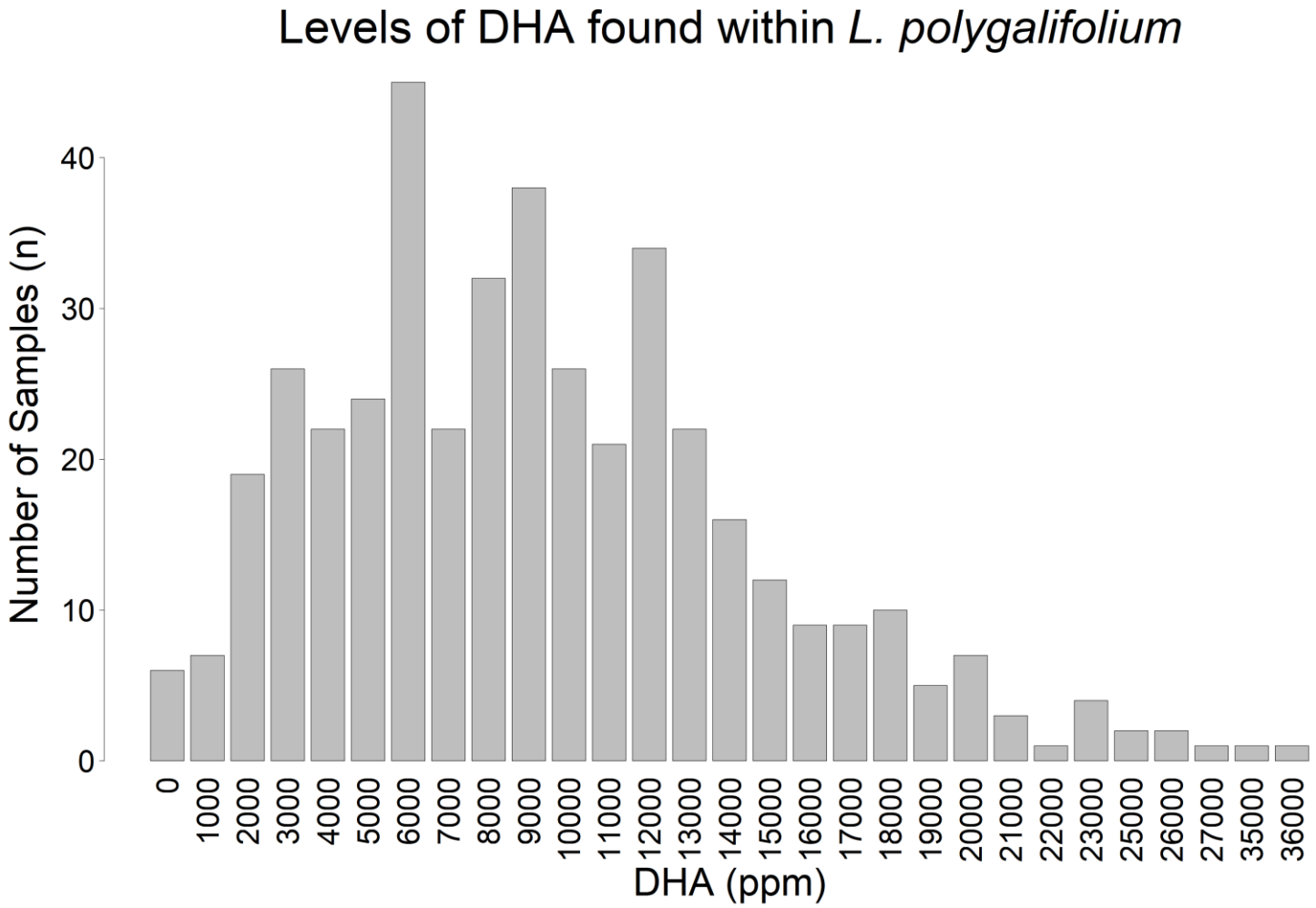




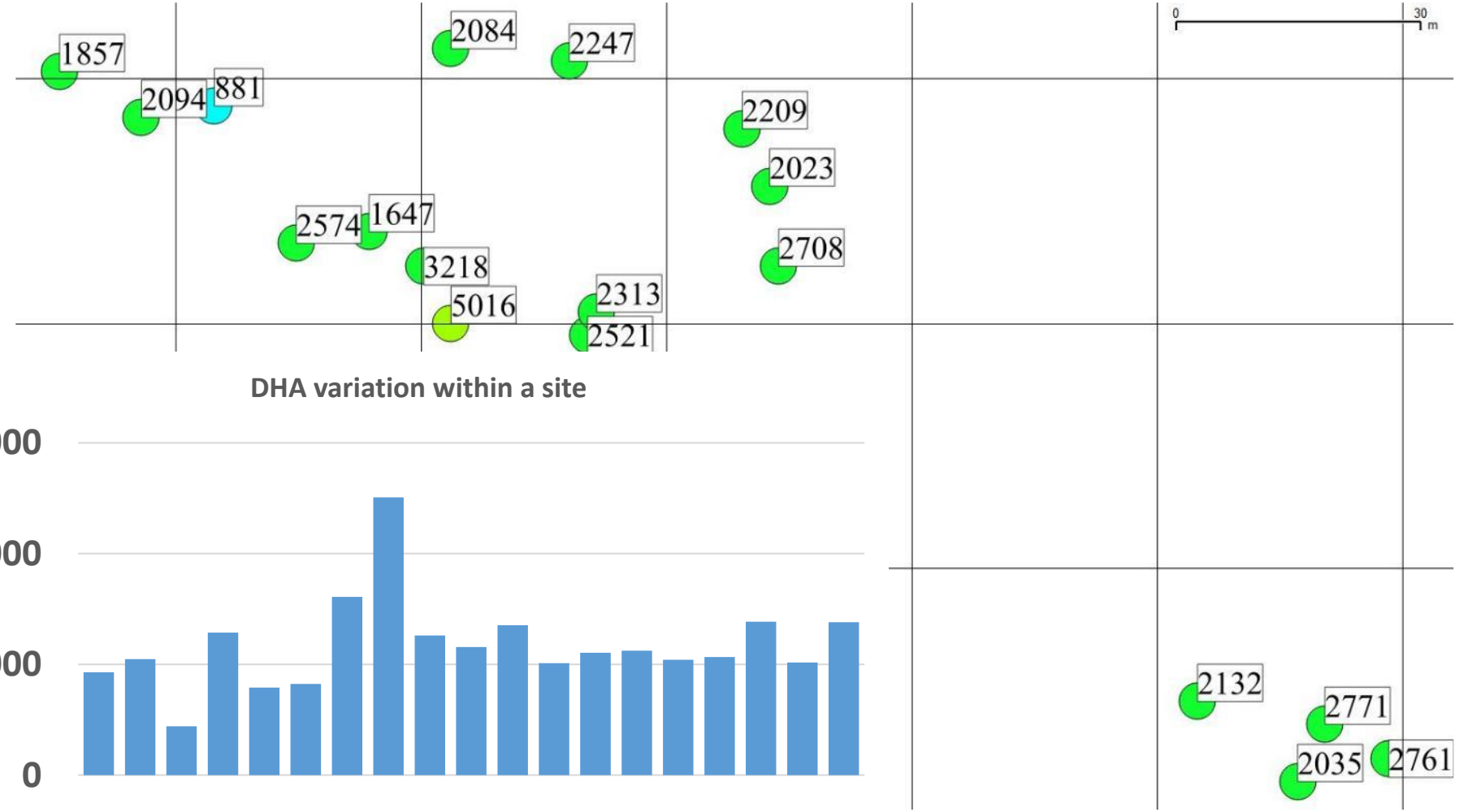
DHA in Nearby Leptospermum

Species Name	DHA (ppm)		
	Min	Mean	Max
L. brachyandrum	3244	5125	8134
L. brevipes	0	501	2514
L. juniperinum	326	4568	11354
L. laevigatum	0	0	0
L. liversidgei	650	6794	16912
L. luehmannii	0	0	0
L. microcarpum	0	0	0
L. neglectum	0	0	0
L. oreophilum	2675	2675	2675
L. petersonii	1869	5246	12990
L. polygalifolium	0	9455	35536
L. semibaccatum	0	0	0
L. speciosum	5107	14739	23787
L. trinervium	0	0	0
L. whitei	7433	16749	27791

L. polygalifolium Nectar DHA range



DHA Variation in a Site



DHA variation within a site

Leptospermum Species

L. whitei

L. polygalifolium

L. laevigatum

L. liversidgei

How to ID *Leptospermum*

L. polygalifolium

Flowers

- 5 petals
- Open dish shape
- Stamens' shorter or similar size to petals

Kunzea ericoides

Sannantha

L. speciosum

How to ID *Leptospermum*

L. speciosum

Leaves

- Variable sizes and shapes
- Alternate arrangement

L. liversidgei

L. laevigatum

How to ID *Leptospermum*

L. laevigatum

Fruit

- Woody or Fleshy
- Loci vary from 3-10
- Can be hairy

L. arachnoides

L. polygalifolium

Can't ID the *Leptospermum* ?

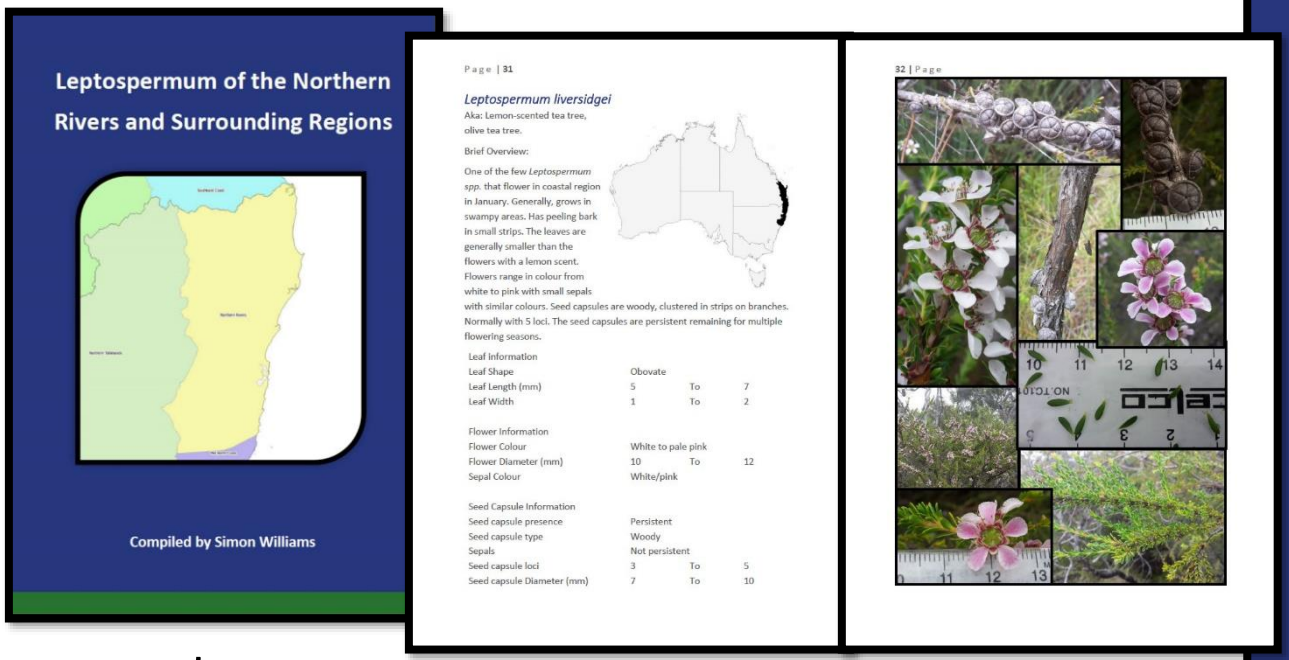
Please include:

Photos of Flowers, leaves and seed capsule if possible

Also:

The location of the tree and when the tree might flower

Leptospermum ID booklets



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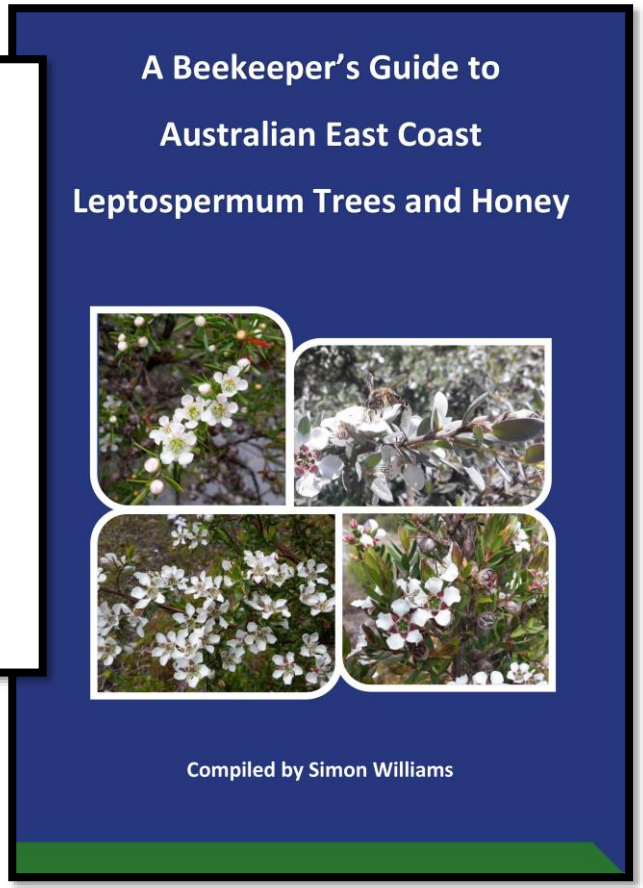

Links at https://www.facebook.com/USCHoneyLab/

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Project support

RURAL INDUSTRIES
Research & Development Corporation

Australian Government
Rural Industries Research and Development Corporation

A big THANK YOU to everyone who has provided assistance and information so far for the project

USC

ithreeinstitute
infection • immunity • innovation

COMVITA

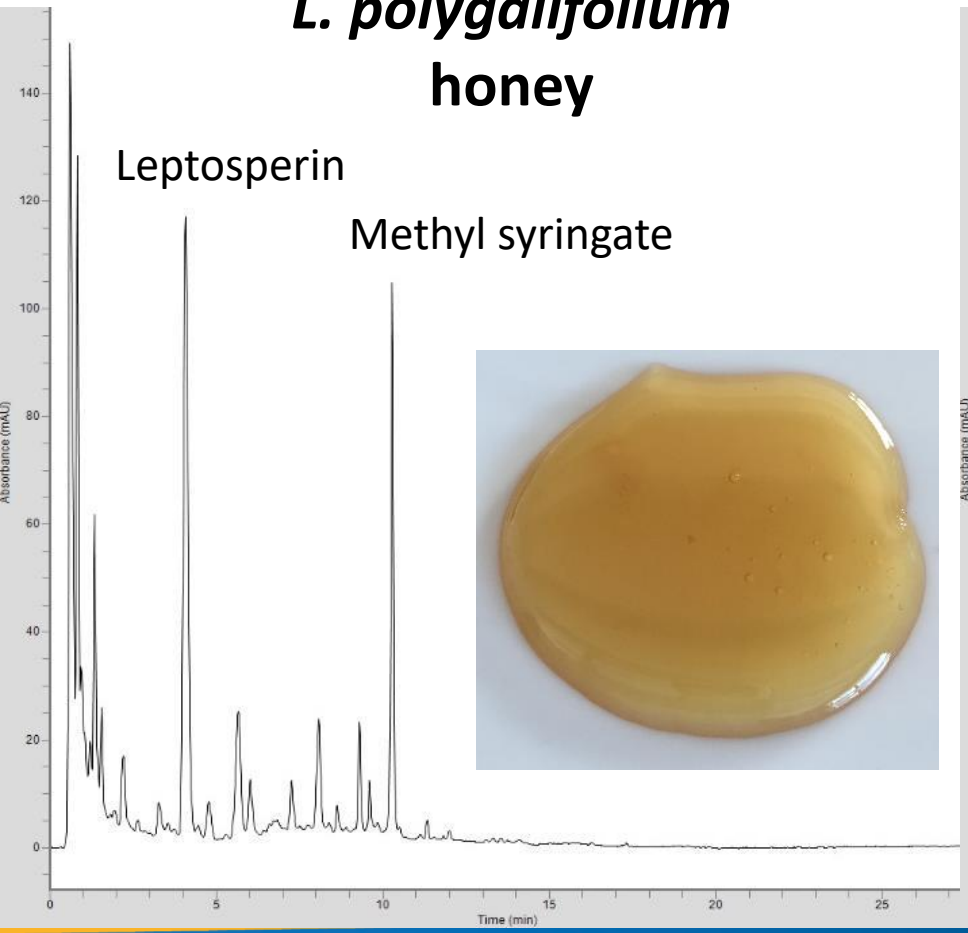
CAPILANO
HONEY LIMITED

University of the Sunshine Coast
Honey Laboratory

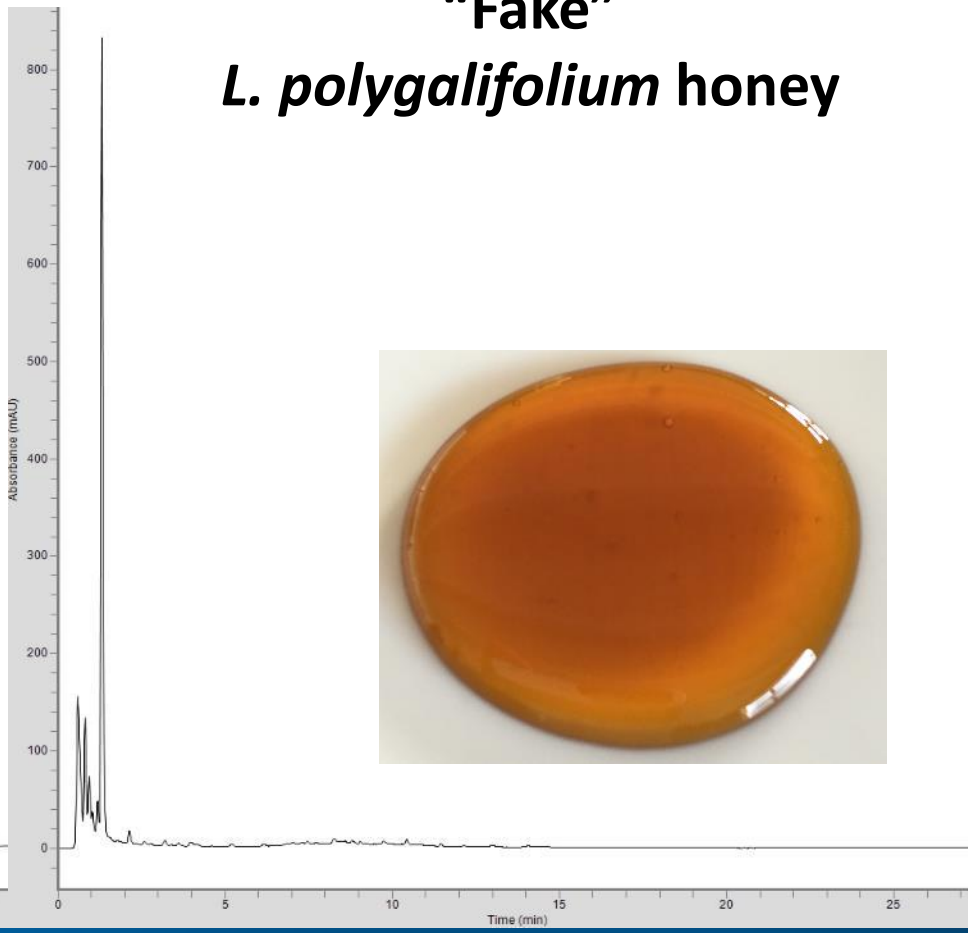
Identifying "Mislabelled" honeys

Reverse-Phase High Performance Liquid Chromatography (RP-HPLC-PDA)

L. polygalifolium honey



"Fake" *L. polygalifolium* honey



Anti-inflammatory activity of honeys

Get Hurt

Tissue damage

Cell membrane phospholipids

Phospholipase A_2

Arachidonic acid

5-Lipoxygenase

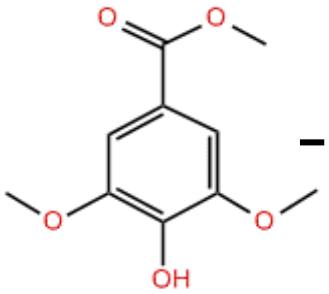
Leukotriene B_4

Neutrophil chemotaxis
Reactive oxygen species
Cytokine release

Causes Inflammation

Pro-inflammatory Arachidonic Acid Cascade

Methyl syringate: Isolated from the honey matrix



Inhibit

Inhibiting 5-LOX enzyme stops the synthesis of inflammatory molecules

5-LOX enzyme inhibition

*These honey varieties had individual samples whose IC_{50} > 2000 µg/mL

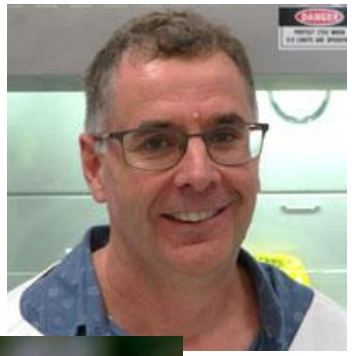
CRC for Honey Bee Products

CRCHBP

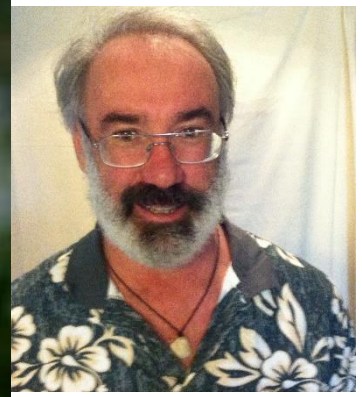
FOR HONEY BEE PRODUCTS

Continuing Research

CRCHBP - Honey Bee Products



- Phytochemical and bioactivity characteristics of honeys by bioregion
- Anti-inflammatory activity test for honey
- Activity correlated to chemical attributes and biogeographical honey activity quantified



Honey Samples

- **Require:**
- 100g of Honey (Filtered where possible)
- Along with some information about the apiary site

All donated honeys will have their MGO, DHA and HMF values tested and numbers supplied to the Bee Keepers at no cost.

Limited to 5 free samples a year for Beekeepers

! All Site Information will be Coded and Restricted to the Researchers Involved in the Project!

For Publications Data will be Averaged Over Regions

Honey Sample forms

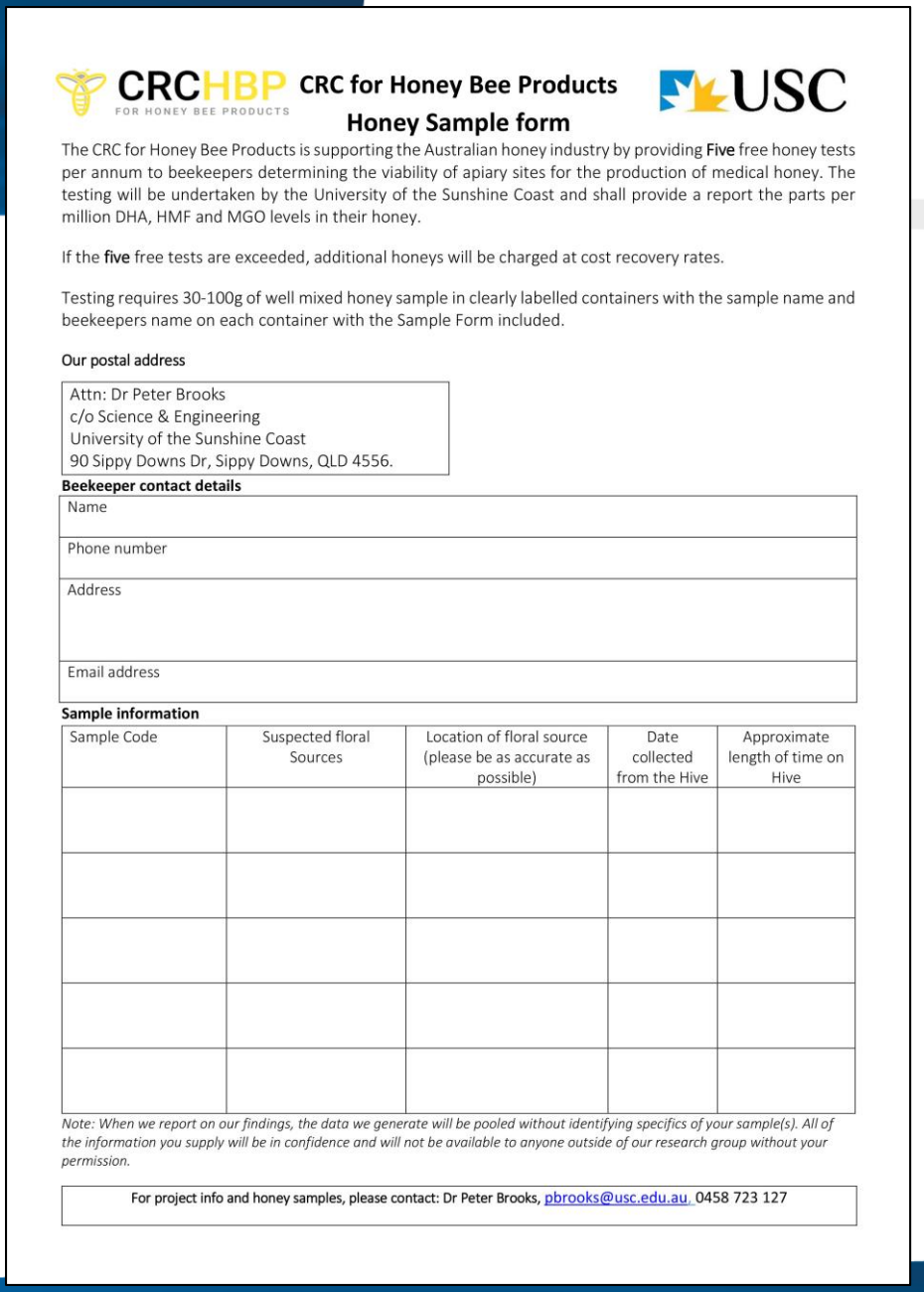
Available from:

Simon Williams

Simon.Williams@research.usc.edu.au

Dr Peter Brooks

PBrooks@usc.edu.au



CRCHBP FOR HONEY BEE PRODUCTS **CRC for Honey Bee Products** USC

Honey Sample form

The CRC for Honey Bee Products is supporting the Australian honey industry by providing **Five** free honey tests per annum to beekeepers determining the viability of apiary sites for the production of medical honey. The testing will be undertaken by the University of the Sunshine Coast and shall provide a report the parts per million DHA, HMF and MGO levels in their honey.

If the **five** free tests are exceeded, additional honeys will be charged at cost recovery rates.

Testing requires 30-100g of well mixed honey sample in clearly labelled containers with the sample name and beekeepers name on each container with the Sample Form included.

Our postal address

Attn: Dr Peter Brooks
c/o Science & Engineering
University of the Sunshine Coast
90 Sippy Downs Dr, Sippy Downs, QLD 4556.

Beekeeper contact details

Name
Phone number
Address
Email address

Sample information

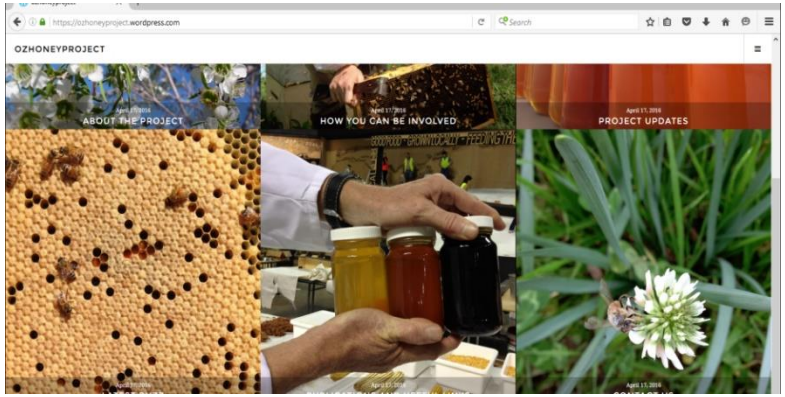
Sample Code	Suspected floral Sources	Location of floral source (please be as accurate as possible)	Date collected from the Hive	Approximate length of time on Hive

Note: When we report on our findings, the data we generate will be pooled without identifying specifics of your sample(s). All of the information you supply will be in confidence and will not be available to anyone outside of our research group without your permission.

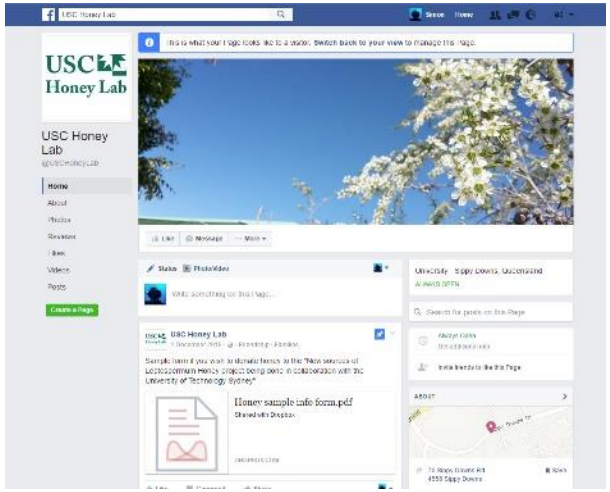
For project info and honey samples, please contact: Dr Peter Brooks, pbrooks@usc.edu.au 0458 723 127

Questions ?

- Simon Williams
- 04 5933 6779
- Simon.Williams@research.usc.edu.au



https://ozhoneyproject.wordpress.com/



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