



# Hemp Processing, Extraction & Testing

**Presented by Jamila La Malfa-Donaldson**  
Aberystwyth University (Wales, UK)  
Cornell University Hemp Webinar Series 2023

# Contents

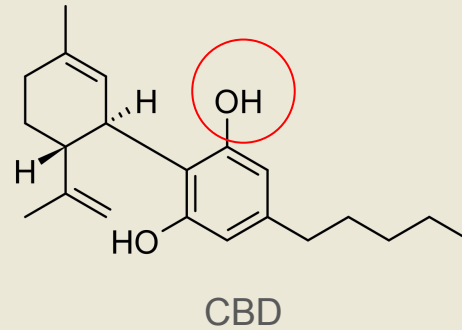
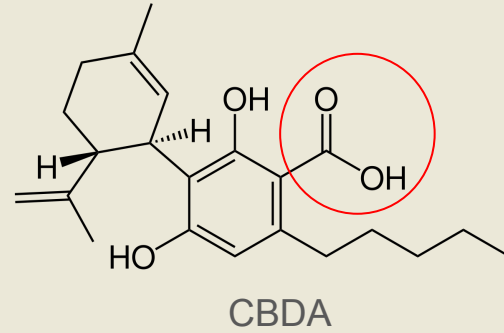
1. Overview of Industrial Hemp
2. Hemp Processing
3. Cannabinoid Testing
4. Hemp Extraction Techniques
5. Solubility of Cannabinoids
6. Decarboxylation
7. Purification Technique: Crystallization
8. CBD Solubility Curves
9. Crystallization of Hemp Distillate
10. Crystallization Scale-Up
11. Summary



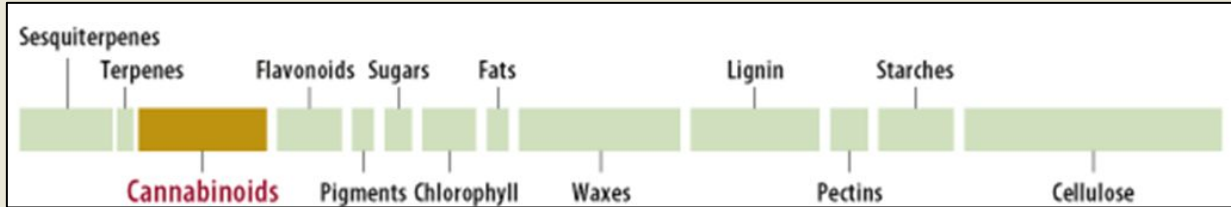
# Overview of Industrial Hemp



Industrial Hemp (*Cannabis sativa* L.)



# Hemp Processing



Extraction

Purification

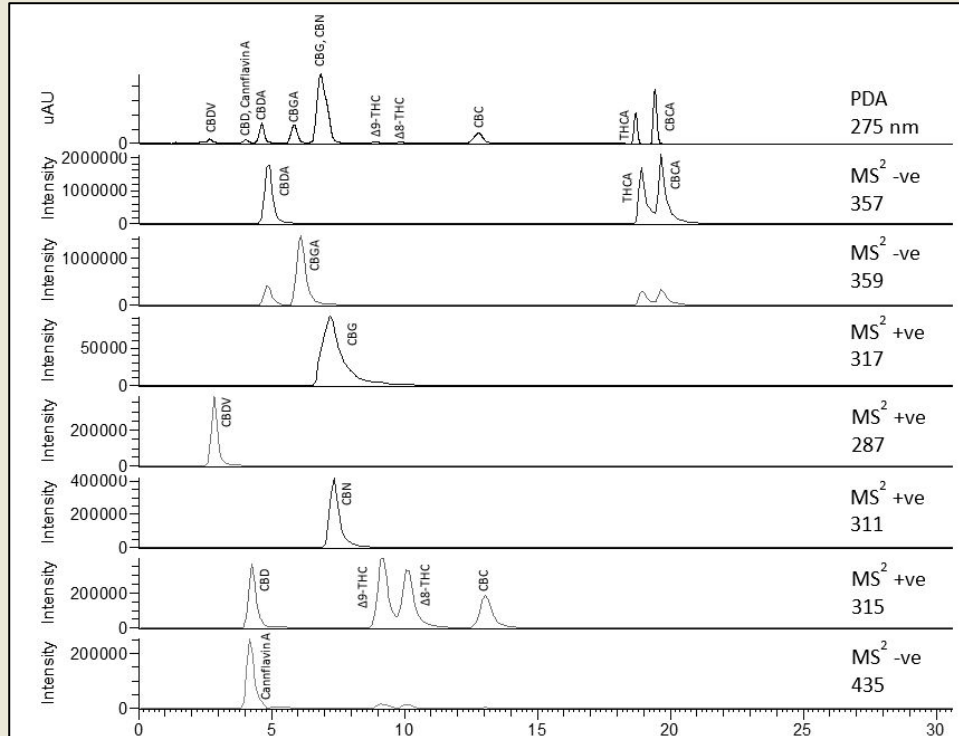
Isolation



Testing

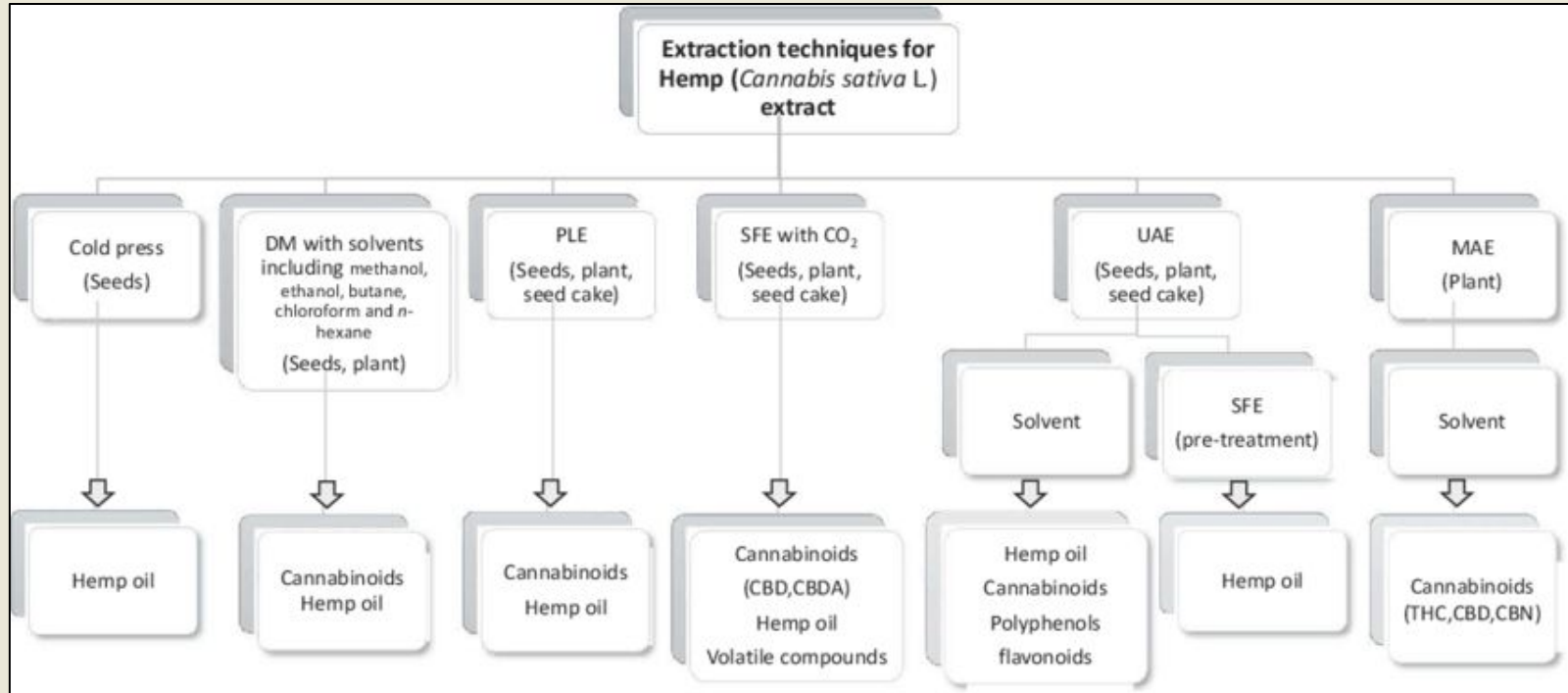
- Chemical Profile
- Microbes
- Pesticides
- Residual Solvents
- Heavy Metals
- Mycotoxins

# Cannabinoid Testing



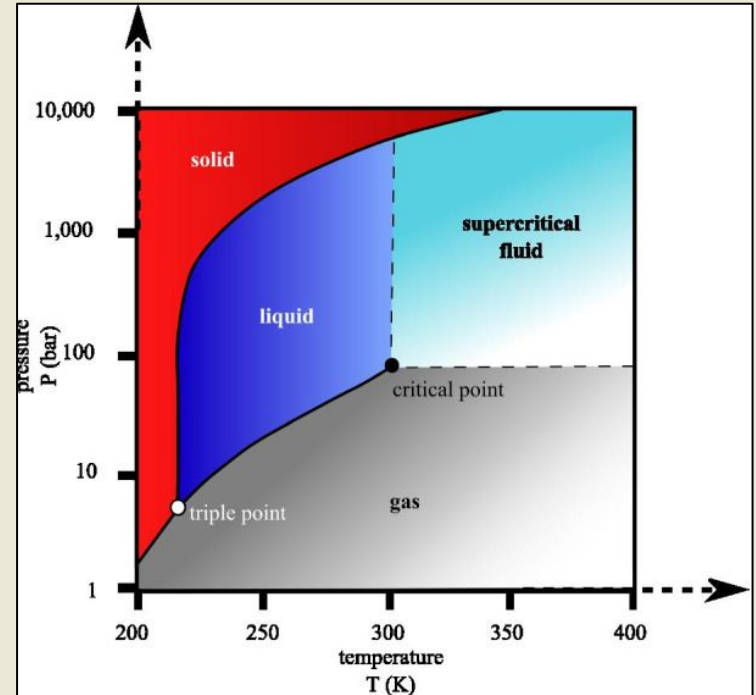
- LC/MS analysis
- Major and minor cannabinoids & cannflavin A
- Sample prep for high sample throughput
- Methanol extraction
- 11 cannabinoids and cannflavin A in 25 mins

# Hemp Extraction Techniques

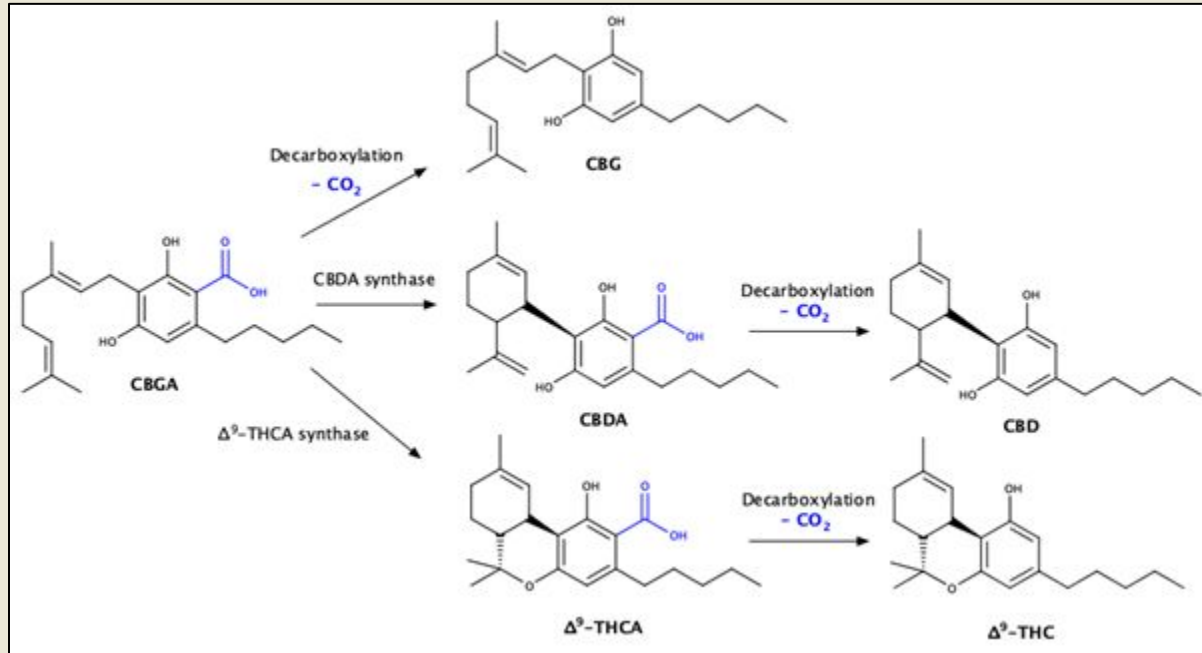


# Solubility of Cannabinoids

Name	Formula	Polarity	Molar mass (g mol <sup>-1</sup> )	Boiling point (° C)
Ethanol	C <sub>2</sub> H <sub>5</sub> OH	Polar	46.07	78.4
Butane	C <sub>4</sub> H <sub>10</sub>	Nonpolar	58.12	- 1.0
Hexane	C <sub>6</sub> H <sub>14</sub>	Nonpolar	86.18	68.0
Methanol	CH <sub>3</sub> OH	Polar	32.04	64.7
Acetone	C <sub>3</sub> H <sub>6</sub> O	Polar	58.08	56.0

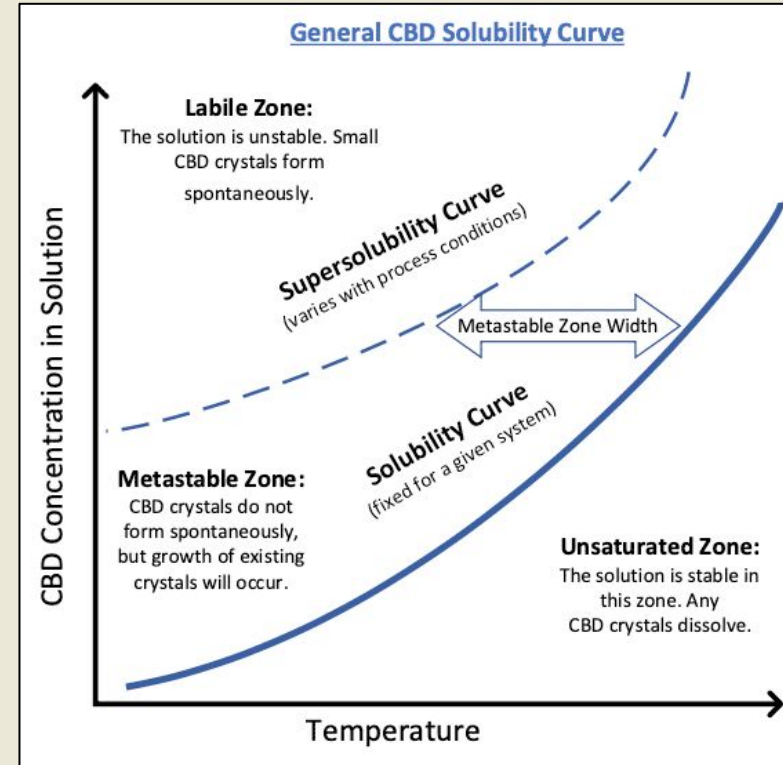
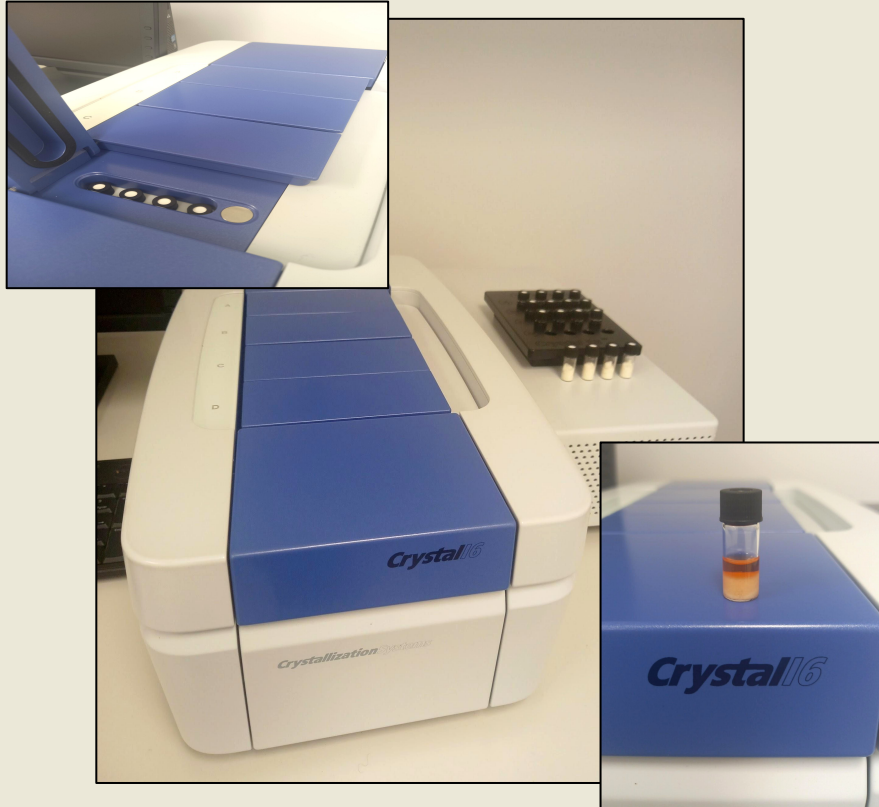


# Decarboxylation

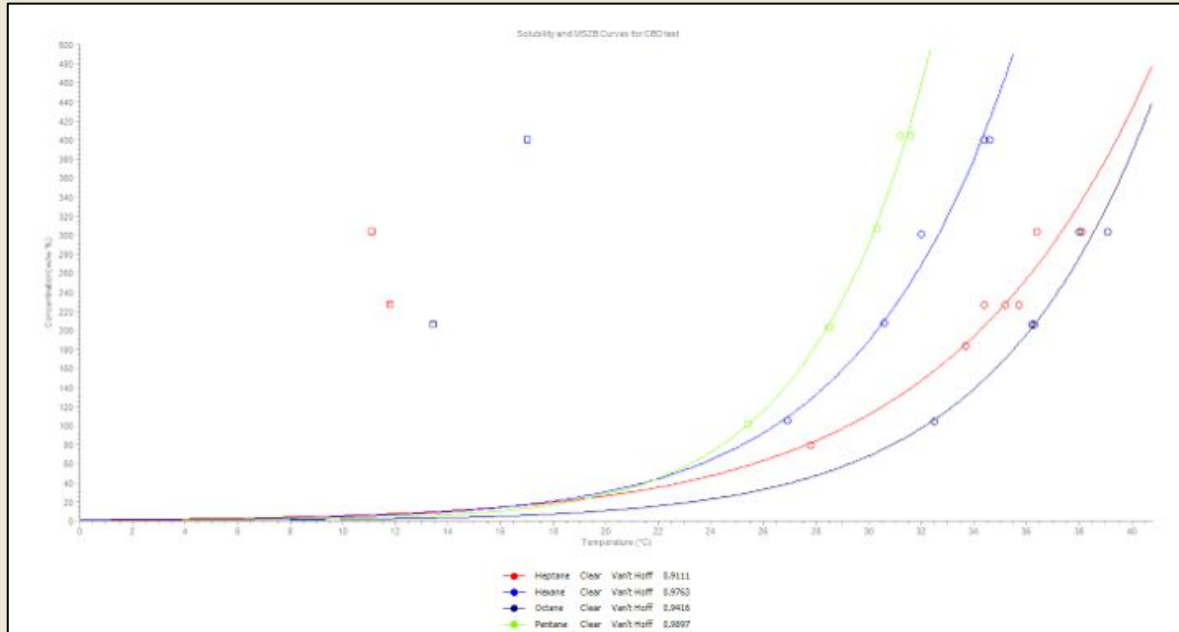




# Purification Technique: Crystallization



# CBD Solubility Curves



CBD isolate in...

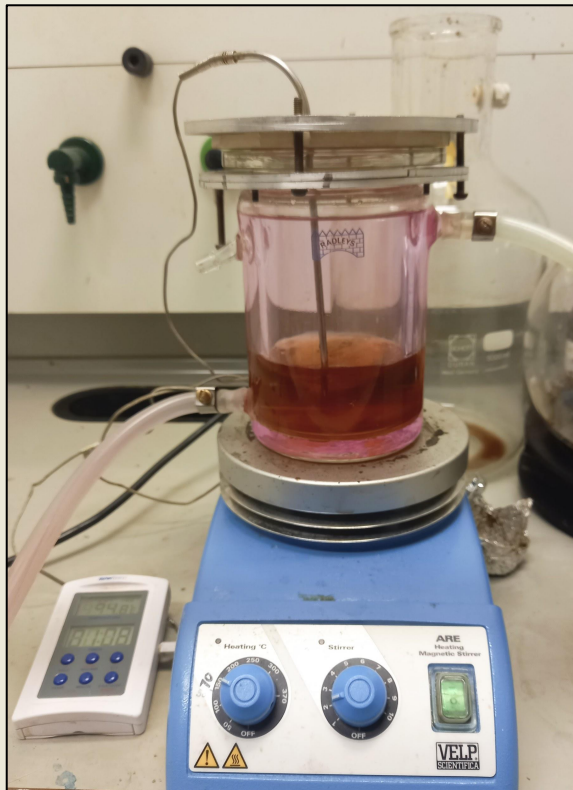
- Pentane
- Hexane
- Heptane
- Octane



# Crystallization of Hemp Distillate

Solvent	CBD crystal purity	% change
Heptane	90%	↑14%
Hexane	90%	↑14%
Pentane	91%	↑16%
Octane	97%	↑23%

# Crystallization Scale-Up



# Summary

- Industrial hemp as source of therapeutic compounds.
- Development and optimisation of processing methods for hemp.
- LC/MS cannabinoid profiling and testing.
- Existing and novel extraction techniques.
- Non-polar solvents better suited for cannabinoids
- Decarboxylation of acid cannabinoids to neutral cannabinoids.
- Crystallization studies for CBD purification.

# About Me



Jamila La Malfa-Donaldson



Jamila La Malfa-Donaldson



[contact@prohempotic.com](mailto:contact@prohempotic.com)

- PhD Industrial Hemp Researcher, Aberystwyth University (Wales, UK)
- MEng Chemical Engineering with Business
- +5 yrs Science Communicator
- Founder of PROHEMPOTIC
- Young Innovators Award 22-23 (Innovate UK)



# Thank You

## Any Questions?

Acknowledgements:

PhD supervisors - Dr Ana Winters & Dr Barbara Hauck

Sponsors - TTS Pharma, KESS II & Technobis