

# Essential oils – pharmacology & other things



Tshwane University  
of Technology  
*We empower people*

**Prof D.R. Katerere**

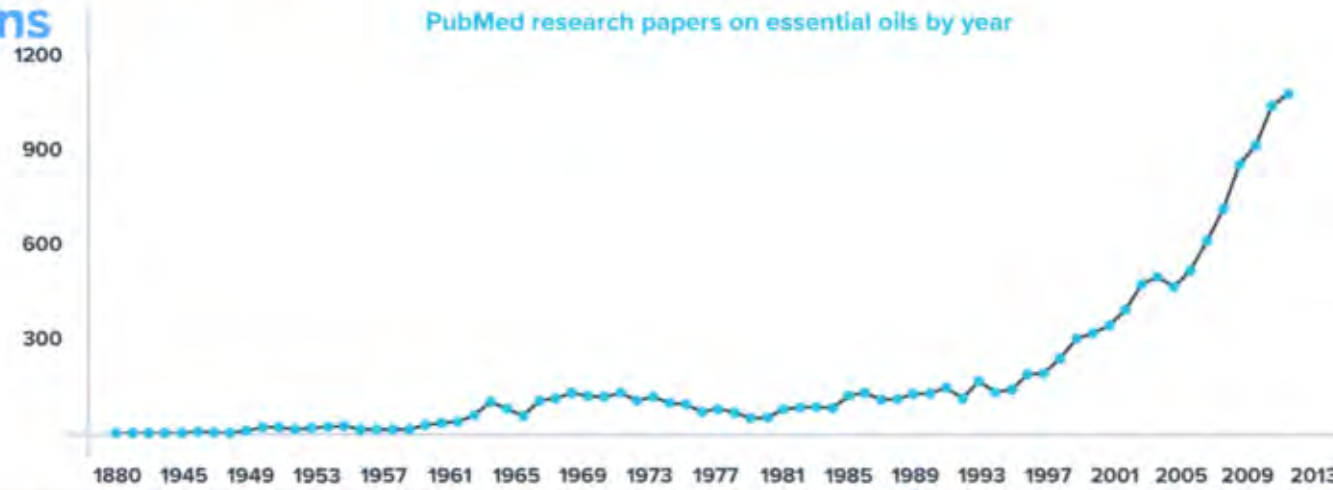
TUT Research Platform Chair - Pharmaceutical & Biotech Advancement in Africa (PBAA)

# Scientific Knowledge About Essential Oils

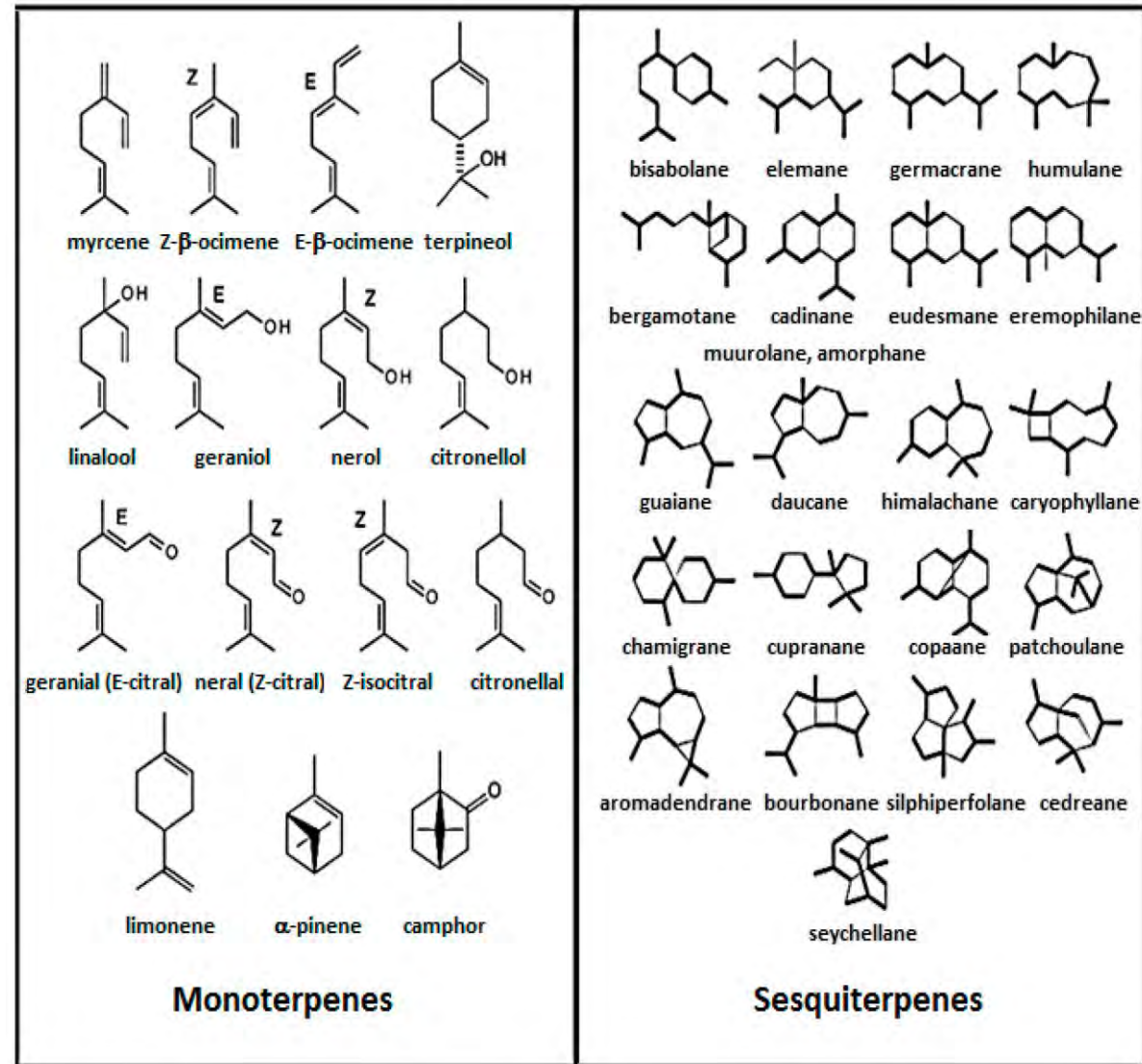
[benbalden.com](http://benbalden.com)

Scientific knowledge is growing exponentially

Many research institutions are joining the cause



# Some chemistry...



# Where are the Africans?

Oil	Plant source	Family
Bay	<i>Pimenta racemosa</i>	Myrtaceae
Bergamot	<i>Citrus bergamia</i>	Rutaceae
Cade	<i>Juniperus oxycedrus</i>	Cupressaceae
Caraway seed	<i>Carum carvi</i>	Apiaceae
Citronella java	<i>Cymbopogon nardus</i>	Gramineae
Cumin	<i>Cuminum cyminum</i>	Apiaceae
Cypress	<i>Cupressus sempervirens</i>	Cupressaceae
Geranium	<i>Pelargonium graveolens</i>	Geraniaceae
Grape fruit	<i>Citrus paradisi</i>	Rutaceae
Lavender	<i>Lavendula officinalis</i>	Lamiaceae
Lemongrass	<i>Cymbopogon citratus</i>	Gramineae
Mandarine	<i>Citrus reticulata</i>	Rutaceae
Nutmeg	<i>Myristica fragrans</i>	Myristicaceae
Palmarosa	<i>Cymbopogon martini</i>	Gramineae
Sage spanish	<i>Salvia officinalis</i>	Lamiaceae
Spearmint	<i>Mentha spicata</i>	Lamiaceae
Thyme red	<i>Thymus vulgaris</i>	Lamiaceae
Vetiver haiti	<i>Vetiveria zizanioides</i>	Gramineae
Wormwood	<i>Artemisia absinthium</i>	Asteraceae
Ylang ylang	<i>Canagaa odorata</i>	Annonaceae

## THE FDA GRAS LIST

Essential oils, oleoresins, and natural extractives (including distillates) that are generally recognized as safe for their intended use.

COMMON NAME	COMMON NAME CONT.
Alfalfa	Lavandin
Allspice	Lemon
Almond, bitter	Lemon balm
Ambrette (seed)	Lemongrass
Angelica root	Lemon peel
Angelica seed	Lime
Angelica stem	Linden flowers
Angostura (cusparia bark)	Locust bean
Anise	Lupulin
Asafetida	Mace
Balm (lemon balm)	Mandarin
Balsam of Peru	Marjoram
Bay leaves	Marjoram, sweet
Bay (myrcia oil)	Mate
Bergamot (orange)	Melissa

# Medical applications

## Antibacterial:

- Clove
- Geranium
- Melaleuca
- Rosemary

## Antiviral:

- Clove
- Melaleuca
- Myrrh
- Melissa
- Oregano

## Analgesic:

- Rosemary
- Peppermint
- Oregano
- Ginger
- Lemon

- inhalation through the olfactory system
- absorption through the surface of the skin
- Oral?
- Steaming?

## Immune Stimulant:

- Frankincense
- Lemon
- Melaleuca
- Oregano
- Thyme

## Anti-Inflammatory:

- Basil
- Bergamot
- Copaiba
- Frankincense
- Wintergreen

## Antirheumatic:

- Oregano
- Thyme
- Cypress
- Birch
- Clove



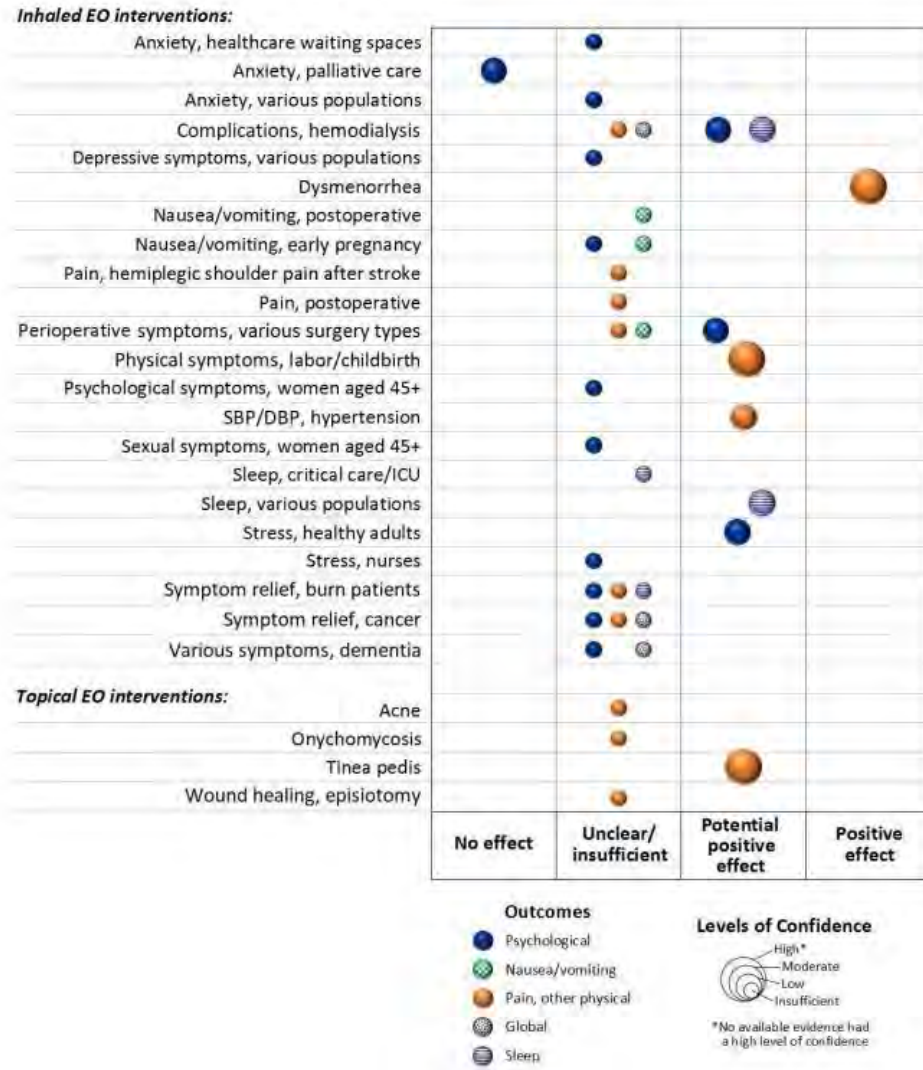
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[wood.osu.edu](http://wood.osu.edu)

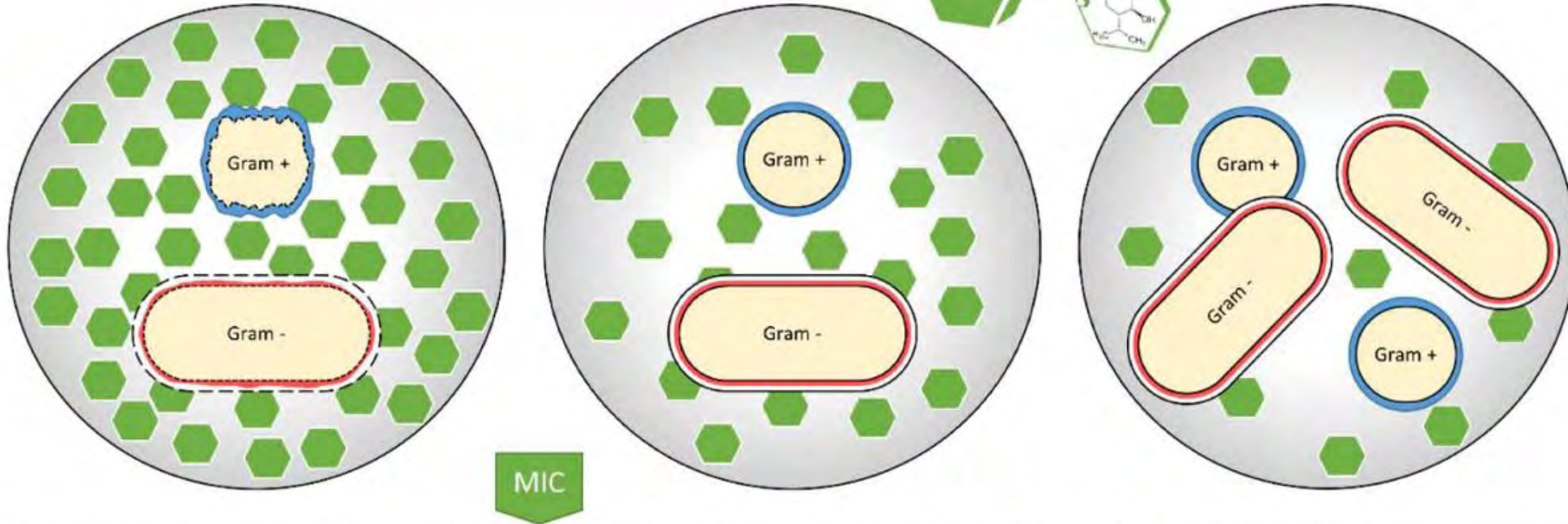
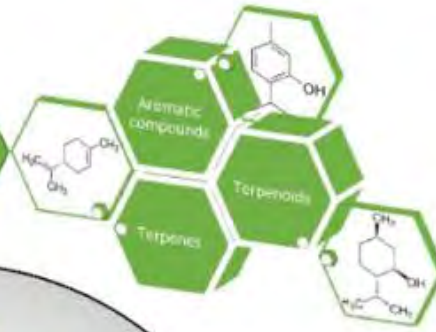
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**Figure. Map of the evidence from systematic reviews of inhaled and topical essential oils for targeted health conditions/populations**



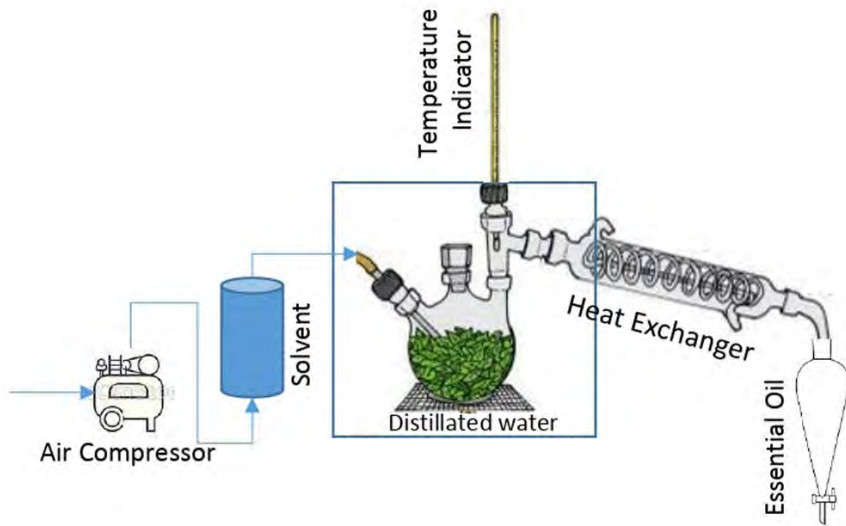
171 eligible trials is represented among the 25 SRs. Hemodialysis, perioperative patients, dysmenorrhea, labor/childbirth, sleep, anxiety, and depression were the most widely studied conditions and/or populations.

# Essential oil



2-fold dilution of essential oil

# Extraction



## How ESSENTIAL OILS are Steam Distilled

EssentialOilsClub.info  
facebook.com/groups/DrZEOclub/

**Essential Oil Defined** – Also known as volatile oils because they evaporate readily, essential oils are the lipophilic (“fat loving”), hydrophobic (“water hating”) *volatile organic compounds* that are found in aromatic plants. They are generally insoluble in water, soluble in alcohol and fixed oils, and can dissolve fatty materials such as grease.

**Step 1**  
Steam is created from boiling water

**Step 2**  
Passing through plant biomass, the steam breaks up the plant micro particles.

**Step 3**  
Separating the volatile from non-volatile organic compounds, both rise with the steam.

**Step 4**  
A condenser cools the steam, which is transformed back to water.

**Step 5**  
In a separator, the volatile principles (i.e. “essential oils”) rise to the top and are extracted.

**Step 6**  
The remaining water contains non-volatile principles known as floral waters (i.e. “hydrosols”) that are useful for body care products and contain subtle medicinal properties.

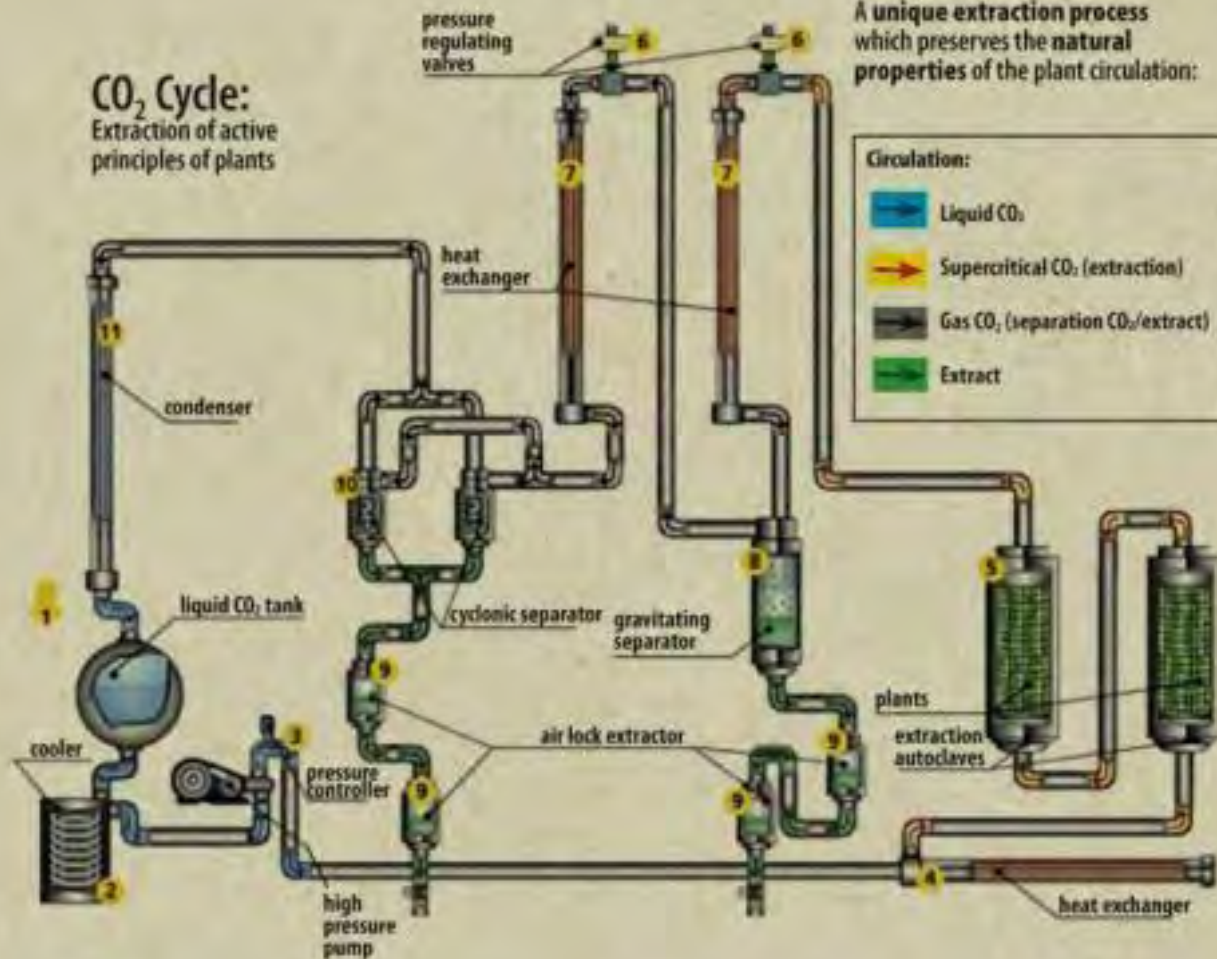
**Step 7**  
The essential oils are tested for purity and sold on the market.

*Note: not all essential oils are steam distilled. Citrus peels are generally expressed (“cold-pressed”) and CO<sub>2</sub> is a popular alternative to solvent extraction.*



# THE SUPERCRITICAL EXTRACTION PROCESS

## CO<sub>2</sub> Cycle: Extraction of active principles of plants



1. **CO<sub>2</sub> storage**
2. **Cooling:** CO<sub>2</sub> passes into a cold exchanger to maintain its liquid state before entering into the high pressure pump.
3. **Pressurization:** the pressure is raised to 300 bars.
4. **Reheating:** the temperature is raised to 31° C. CO<sub>2</sub> is supercritical.
5. **Extraction:** CO<sub>2</sub> supercritical is used as solvent to extract active plant ingredients without denaturing them.
6. **Relaxation:** Lowering of the pressure and thus return of the CO<sub>2</sub> to a gas state allows the separation of the extract from CO<sub>2</sub>.
7. **Reheating:** The temperature is maintained at 30° C.
8. **Separation:** 1st separation stage: separation of CO<sub>2</sub> from the extract by gravity.
9. **Under pulling:** The extract is decompressed gradually to be under drawn in total safety.
10. **Cydonic separation:** 2nd stage separation: Separation of CO<sub>2</sub> extract by centrifugal force.
11. **Liquefaction:** still in a gas state, CO<sub>2</sub> is cooled for liquefaction.

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Local news

# TUT and CSIR establish cannabis research hub

"Hemp and cannabis are included in the scope of the master plan, covering medicinal industrial and recreational use, cosmetics, food and beverages.

July 18, 2022

Tebogo Katsedi 2 minutes read



# Sub-industries



CBD Oil in South Africa Is Av...  
cbdstore.co.za



NuCare CBD Oil 600mg 3...  
takealot.com



Extract 500mg Premium  
takealot.com



# State of play

- Lack of standardization
- Lack of laboratory infrastructure
- Lack of phytosanitary awareness / support
- Lack of regulations
- Over-regulation
- Informal industry
  - Survivalist
  - Magico-spiritual
  - Cultural is political
  - entrepreneurs



# What needs to be done?

- Standardization....AAMPS
  - Need more contributors
- Training....PharmaConnect Africa
  - Need to build partnerships & funding
- Research that supports industry...CSIR / TUT
  - Need to interact with entrepreneurs



Thank you



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