SUPERCRITICAL FLUID EXTRACTION OF BIOACTIVE COMPOUNDS

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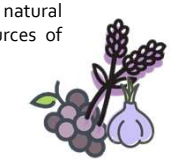
INTRODUCTION

The increase in the demand of nutraceutical and pharmaceutical products of natural origin has led to the search of sources of **bioactive compounds**

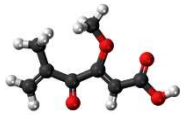


Nutraceutical and pharmaceutical products

> LAVENDER ESSENTIAL OIL

Alternative to traditional drugs for skin diseases

- ✓ Antioxidant
- ✓ Anti-inflammatory
- ✓ Antifungical
- ✓ Antimicrobial



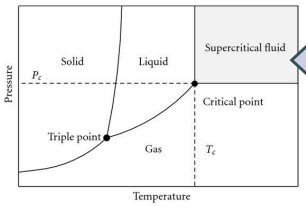
LINALOOL

> SUPERCRITICAL FLUID EXTRACTION

Efficient and environmentally friendly extraction method

$scCO_2$

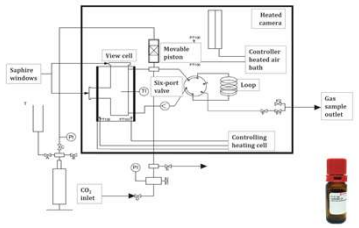
- ✓ Tc=31 ºC, Pc=73 bar
- ✓ Non-toxic
- ✓ Easily separable
- ✓ Non-flammable
- ✓ Low cost



METHODOLOGY

1 EVALUATION OF SOLUBILITY OF LAVENDER ESSENTIAL OIL IN $scCO_2$

HIGH PRESSURE VIEW CELL
t= 48 h
P= 120–180 bar
T= 40-80 ºC



2 SEMIEMPIRICAL MODELLING OF THE EQUILIBRIUM SYSTEM

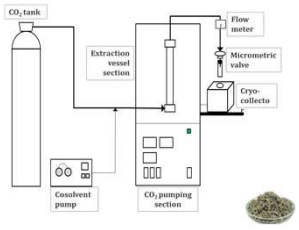
$$\ln S = C_1 + \frac{C_2}{T} + C_3 \ln \rho_{CO_2}$$ — Chrastil (1982)

$$\ln S = C_1 + \frac{C_2}{T} + \frac{C_3}{T^2} + C_4 \ln \rho_{CO_2}$$ — Del Valle y Aguilera (1988)

$$\ln S = C_1 + \frac{C_2}{T} + K \ln \rho_{CO_2}; K = C_3 + C_4 \rho_{CO_2} + C_5 \rho_{CO_2}{}^2$$ — Adachi y Lu (1983)

3 ANALYSIS OF EXTRACTION CONDITIONS

SUPERCRITICAL FLUID EXTRACTOR
t= 2 h
P= 120–300 bar
T= 40-80 ºC



4 CHARACTERIZATION OF EXTRACTS

Composition
- GC-MS
- HPLC

Antioxidant potential
- DPPH assay

EXPERIMENTAL RESULTS

Influence of pressure and temperature in *solubility*

Table 1. Lavender essential oil solubility study

Solubility (kg lavender/m³ CO_2)	40 ºC	60 ºC	80 ºC
120 bar	13,897	6,592	3,895
140 bar	16,594	16,610	9,345
180 bar	22,689	21,803	11,147

P ↑ T ↓ → Solubility ↑

Adjustment of semi-empirical equations

"Adachi y Lu" semi-empirical equation is ideal for the modelling of experimental data

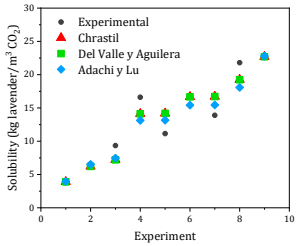


Figure 2. Semiempirical modelling of equilibrium system

Influence of pressure and temperature in *extraction yield*

Table 3. Extraction of lavender essential oil results

Yield (%)	40 ºC	60 ºC	80 ºC
120 bar	2,08	1,92	-
180 bar	1,84	2,44	-
250 bar	1,71	3,61	-
300 bar	1,84	2,56	-

CO_2 Cosolvent ↑ Extraction Yield

+ Cosolvent (1 ml/min)

Yield (%)
- Ethanol: 11,3
- Ethyl Acetate: 35,45

GC-MS analysis

2 main components
- **Linalool**
- **Linalyl acetate**

Temperature ↑ Concentration ↑

The **pressure** has no significant effect on the concentration of extracts.

Acknowledgements

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itquima Uclm

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