2.ZORH – Susret znanstvenika, djelatnika i studenata na temu zaštite okoliša u RH,
Split, 26. i 27. travanj 2019.

TOBACCO WASTE- A NEW POTENTIAL SOURCE FOR EXTRACTION OF BIOACTIVE COMPOUNDS

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On going research:

***NEW Installation Research Projects**: „Application of innovative techniques of the extraction of bioactive components from by-products of plant origin" (2018-2023)*

Principal Investigator: Stela Jokić

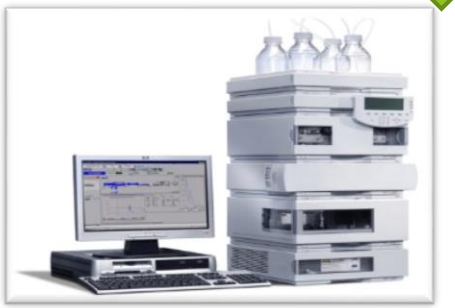
*(Budget: **1.607.708,72 HRK**)*

- Cocoa shell
- Citrus peel
- Tobacco waste

GREEN EXTRACTION TECHNIQUES:

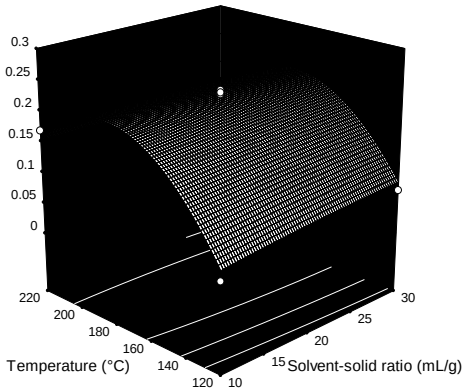
UAE Ultrasound assisted extraction
MAE Microwave assisted extraction
SFE Supercritical fluid extraction
SWE Subcritical water extraction
HVED High voltage electrical discharge extraction
DES Extraction with deep eutectic solvents

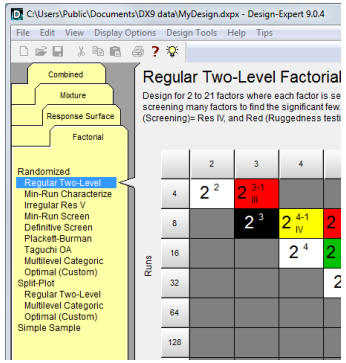
ANALYSIS



HPLC

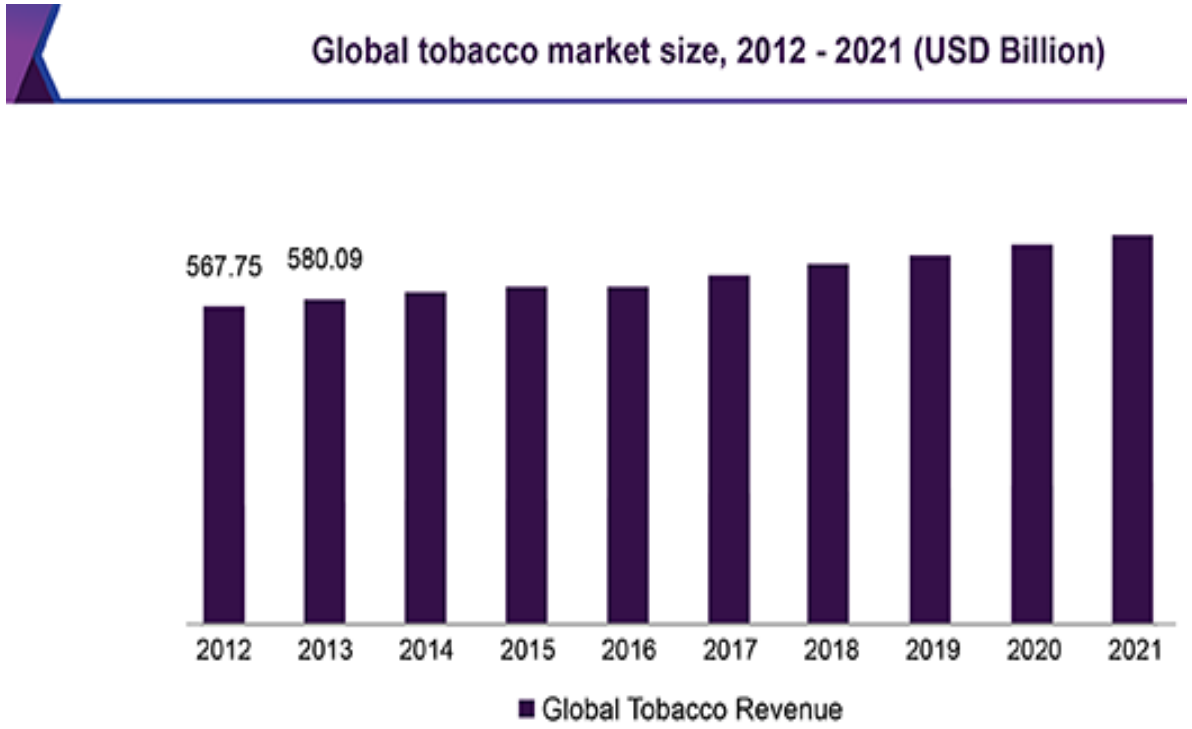
GC-MS

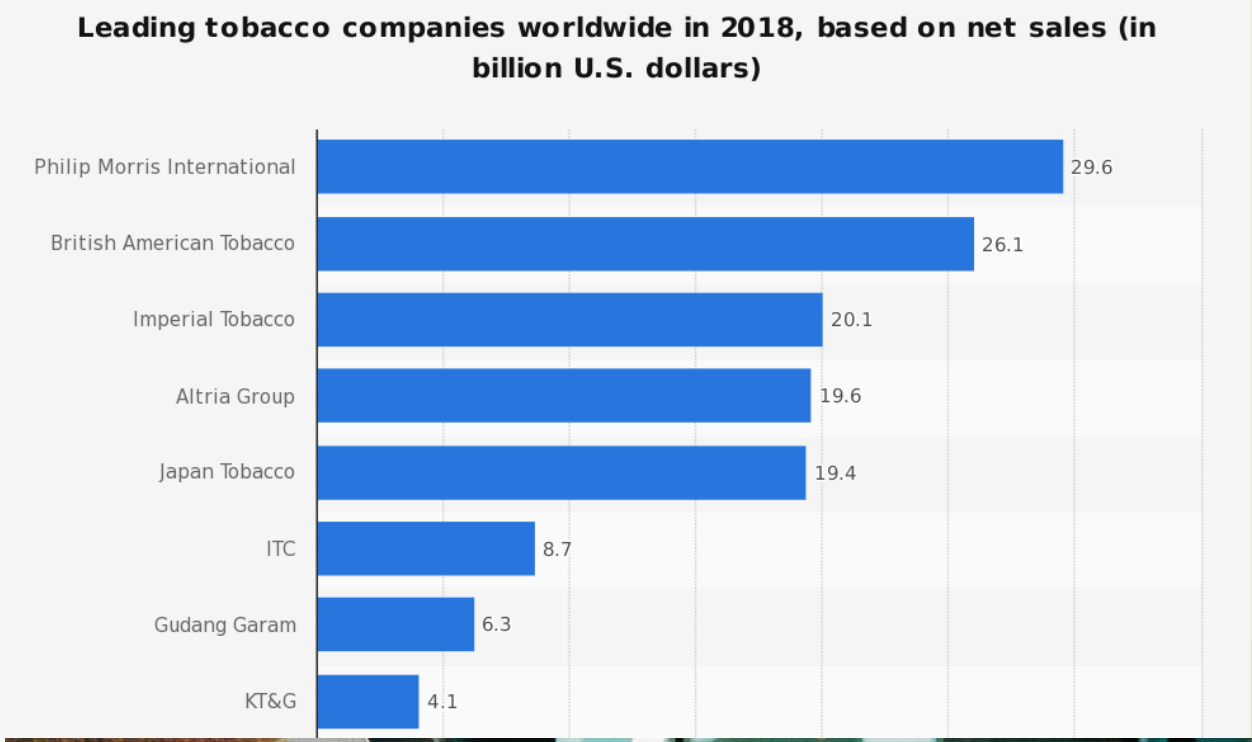




OPTIMIZATION

TOBACCO INDUSTRY





Tobacco industry in Republic Croatia

100 000 000 seedlings

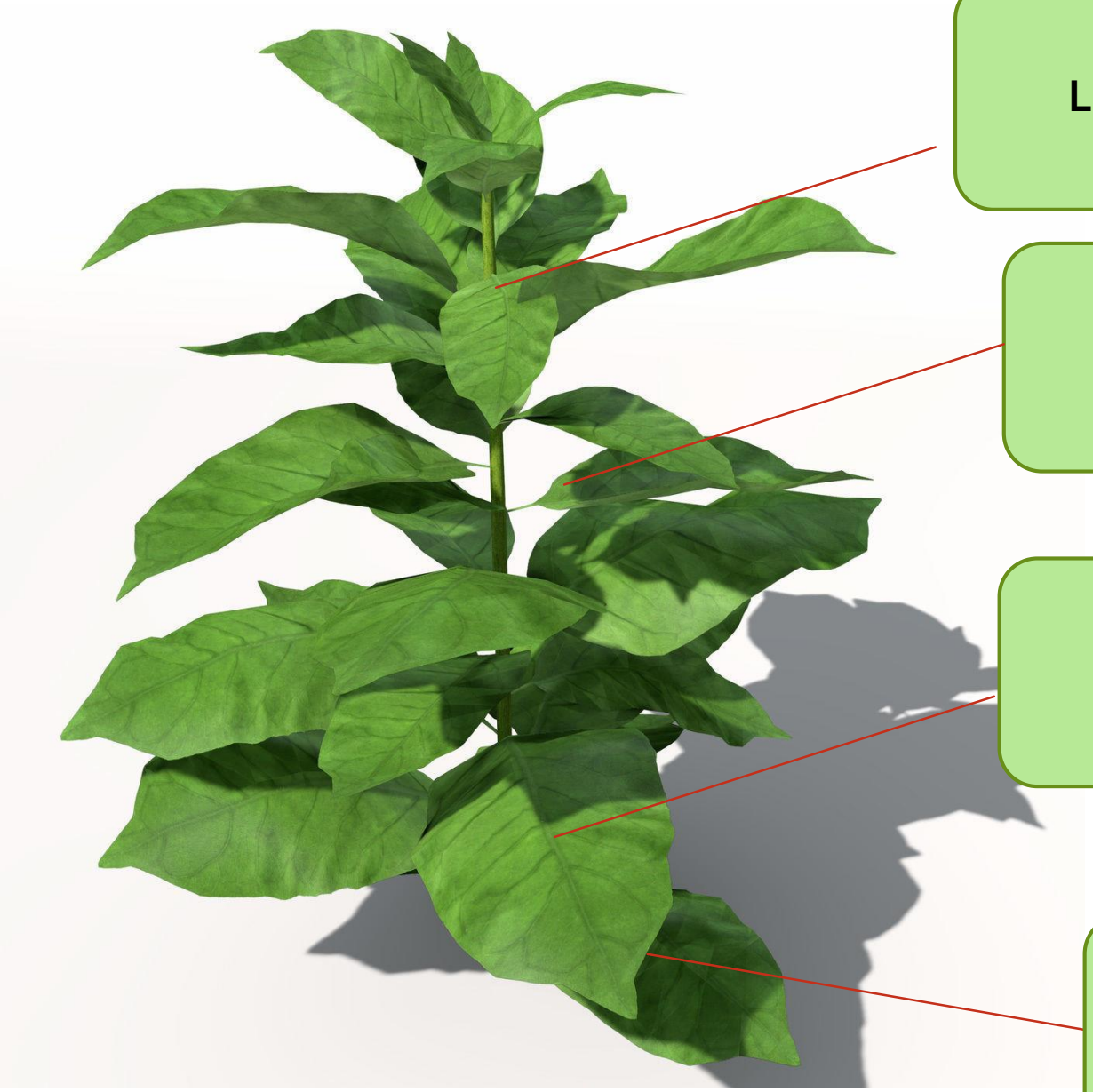
5 500 ha

1200 farms

10 500 000 Kg

4% state budget

25% smokers

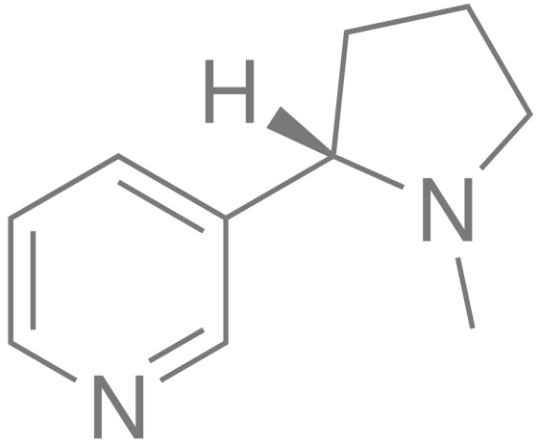


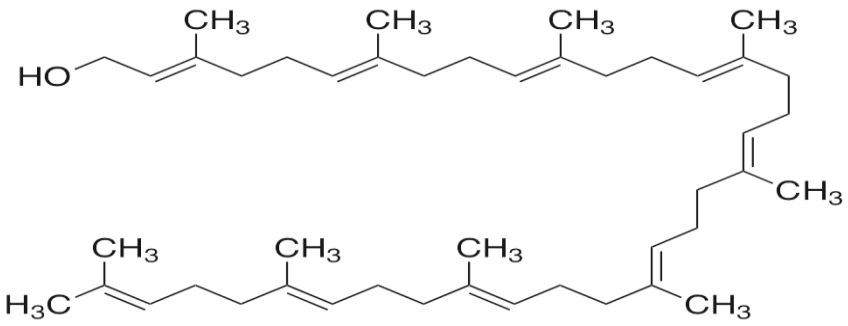
LEAF

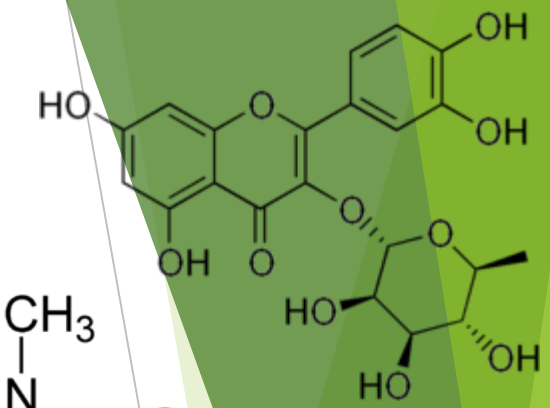
STEM

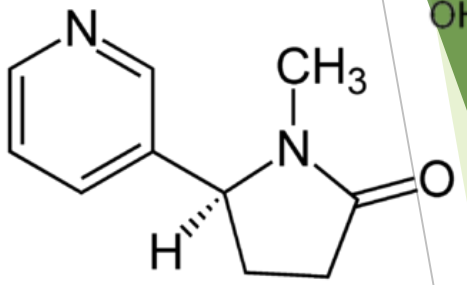
MIDRIB

SMALL PARTS „SCRAP AND DUST”

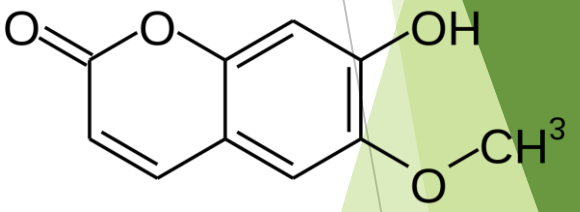


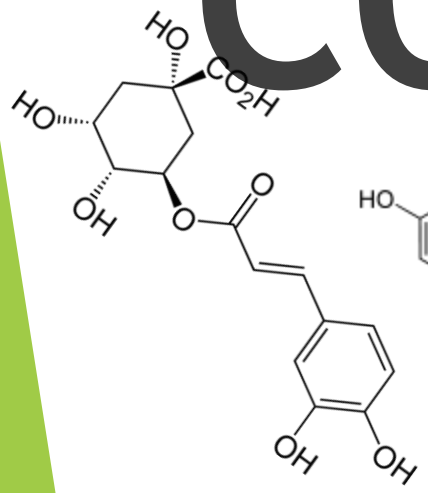


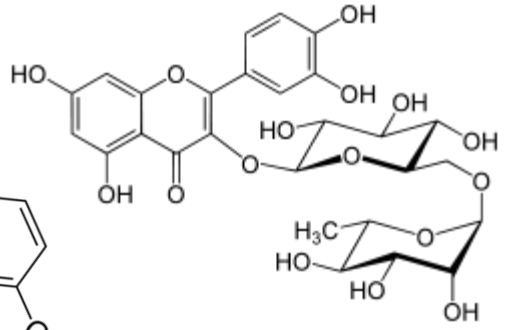


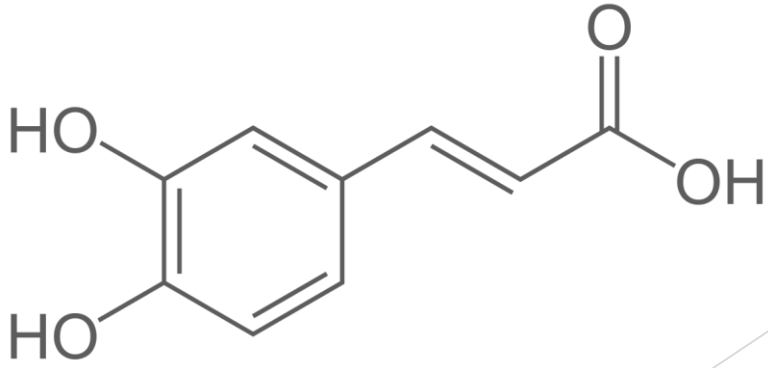


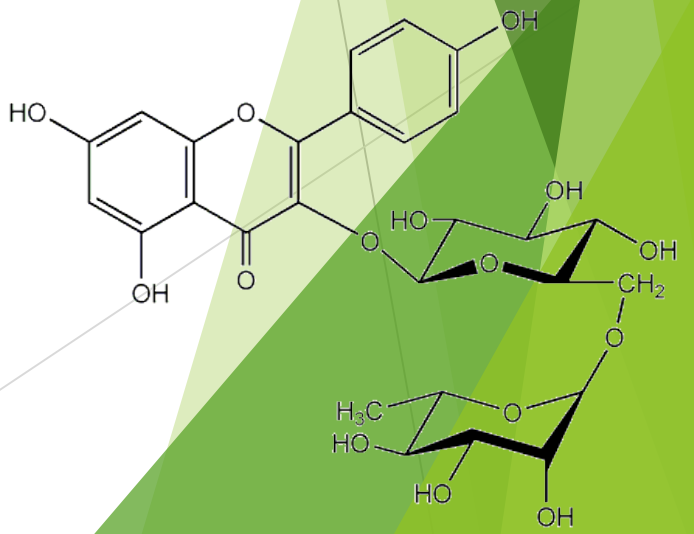
BIOACTIVE COMPOUNDS



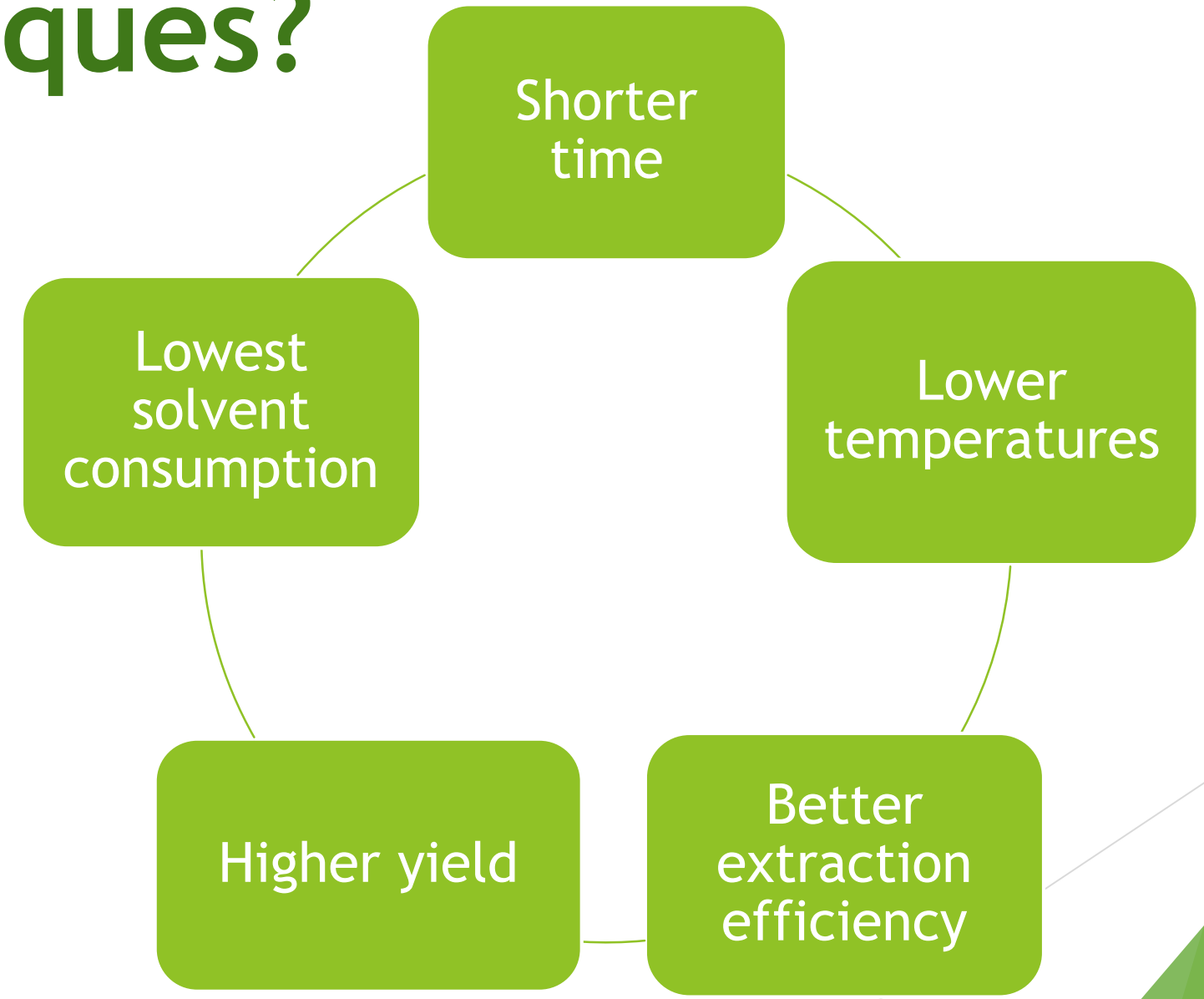






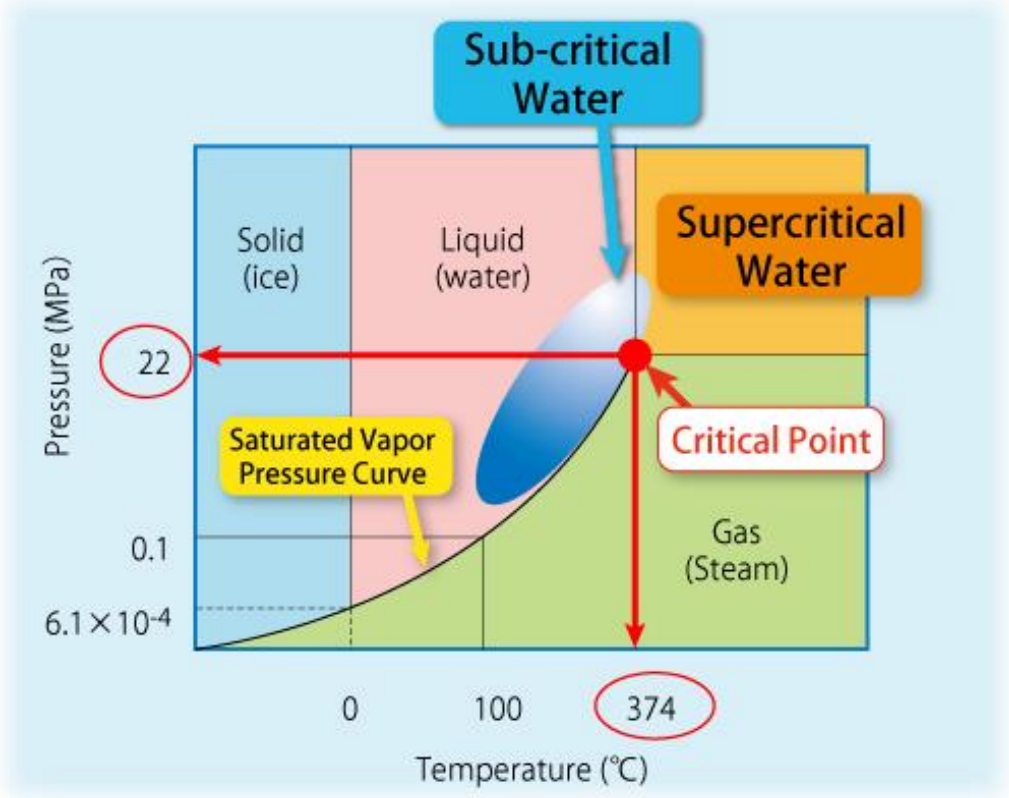


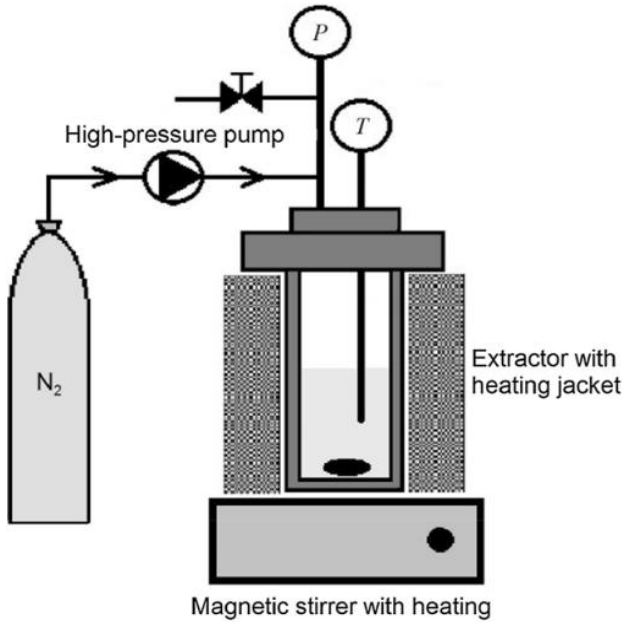
Why green extraction techniques?



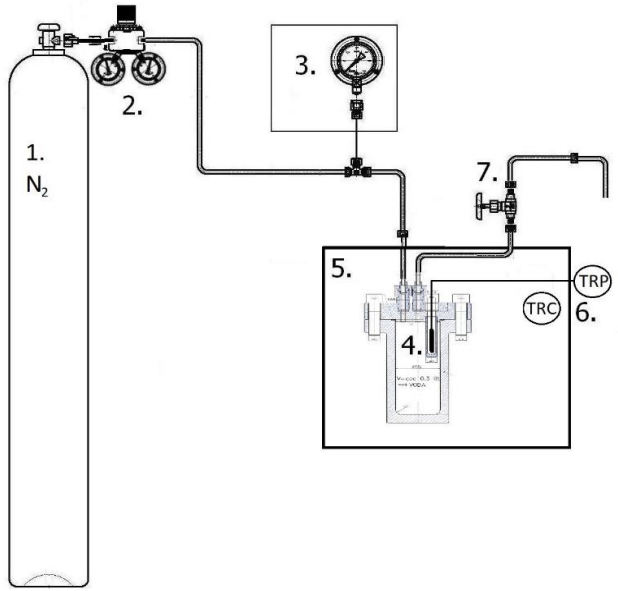
SWE-Subcritical water extraction

- Safe, non-toxic, non-flammable and environmentally friendly solvent
- Available and cheap solvent
- Obtained extracts are safe
- Caracterized by higher diffusion into the plant matrix and increased mass-transfer properties
- Can be applied for extraction of low-polar and non-polar compounds



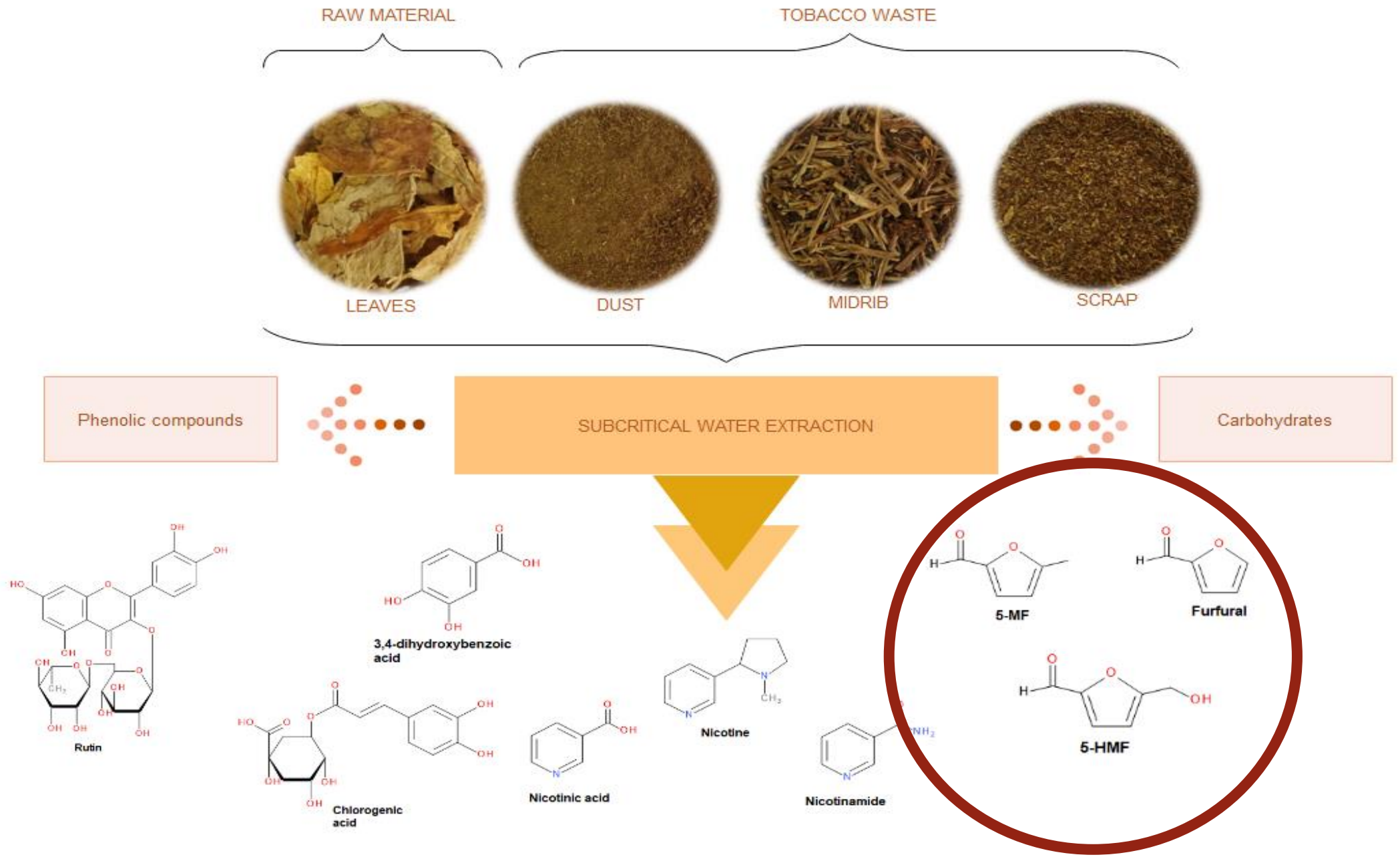


Scheme of apparatus for batch PHWE (Maribor, Slovenia)



(1) N_2 tank (2) Regulator N_2 20/5 MPa (3) Manometer 0-20 MPa (4) Extraction vessel 20 MPa, 200°C (5) Oven 20-300°C (6) TRC - Temperature regulator controller; TRP - Temperature regulated probe (7) High pressure needle valves

SWE


RAW MATERIAL
TOBACCO WASTE
LEAVES
DUST
MIDRIB
SCRAP
Phenolic compounds
SUBCRITICAL WATER EXTRACTION
Carbohydrates
Rutin
3,4-dihydroxybenzoic acid
Chlorogenic acid
Nicotinic acid
Nicotine
Nicotinamide
5-MF
Furfural
5-HMF

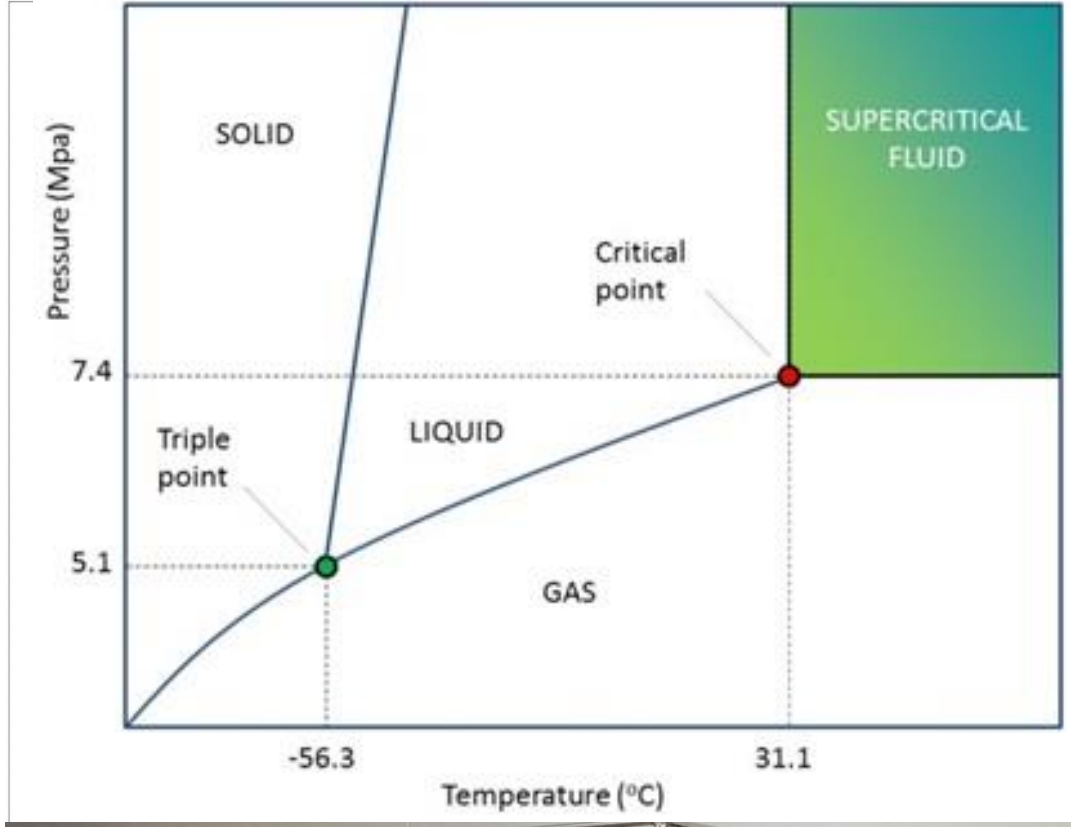
SUPERCRITICAL CO_2 EXTRACTION

ADVANTAGES

- Elimination of organic solvents
- Shorter time
- Lower temperatures
- Complete separation of solvent from extracts
- Easy solvent recovery

DISADVANTAGES

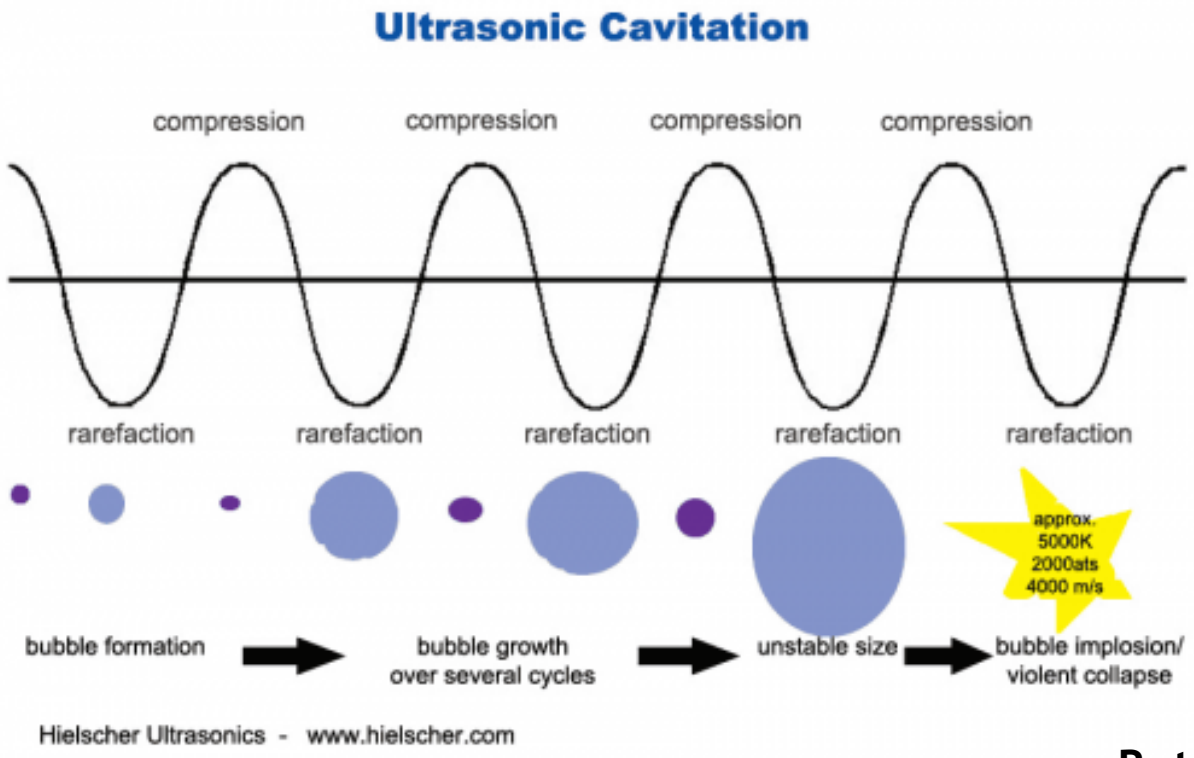
- High pressures
- High investment cost
- High polar compounds are insoluble

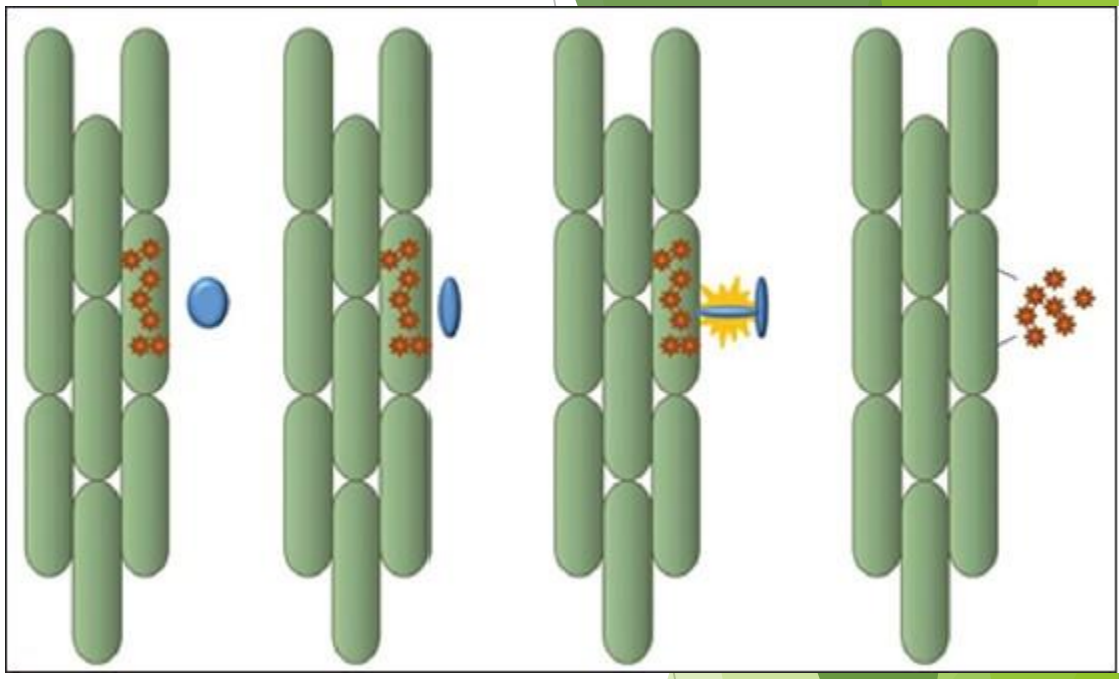


SFE

- NICOTINE
- POLAR COMPOUNDS
- AROMA COMPOUNDS

ULTRASOUND ASSISTED EXTRACTION (UAE)



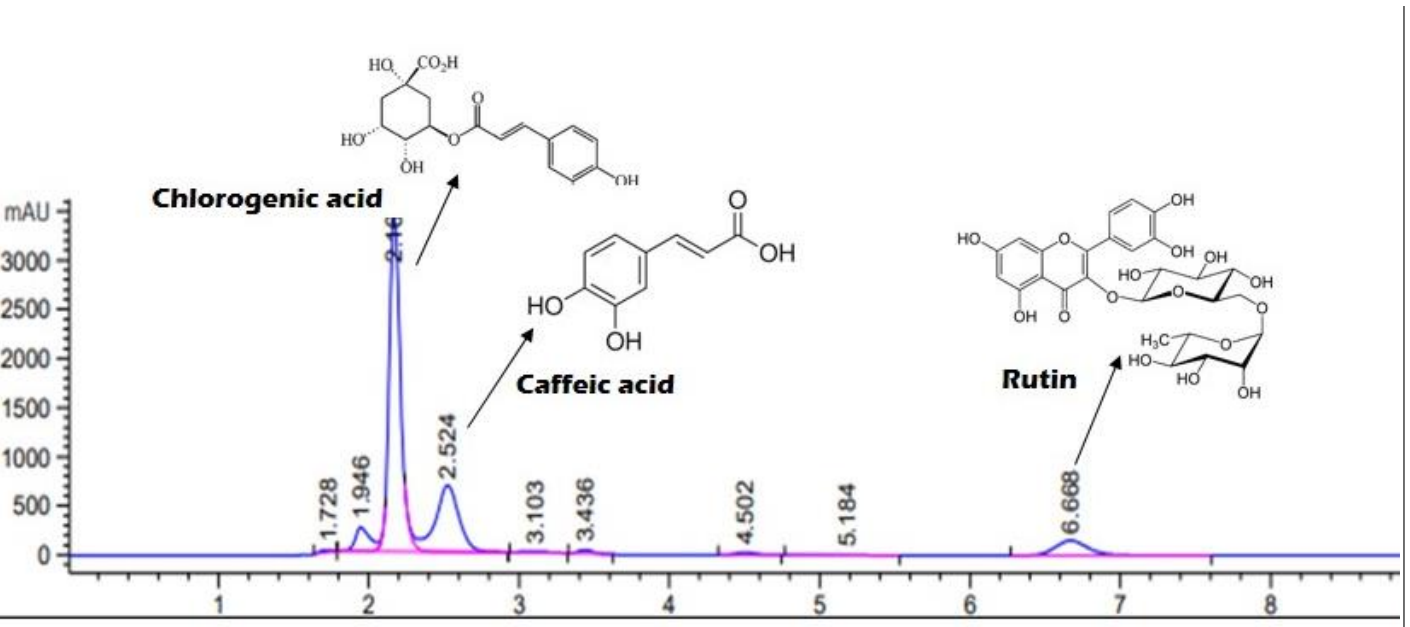


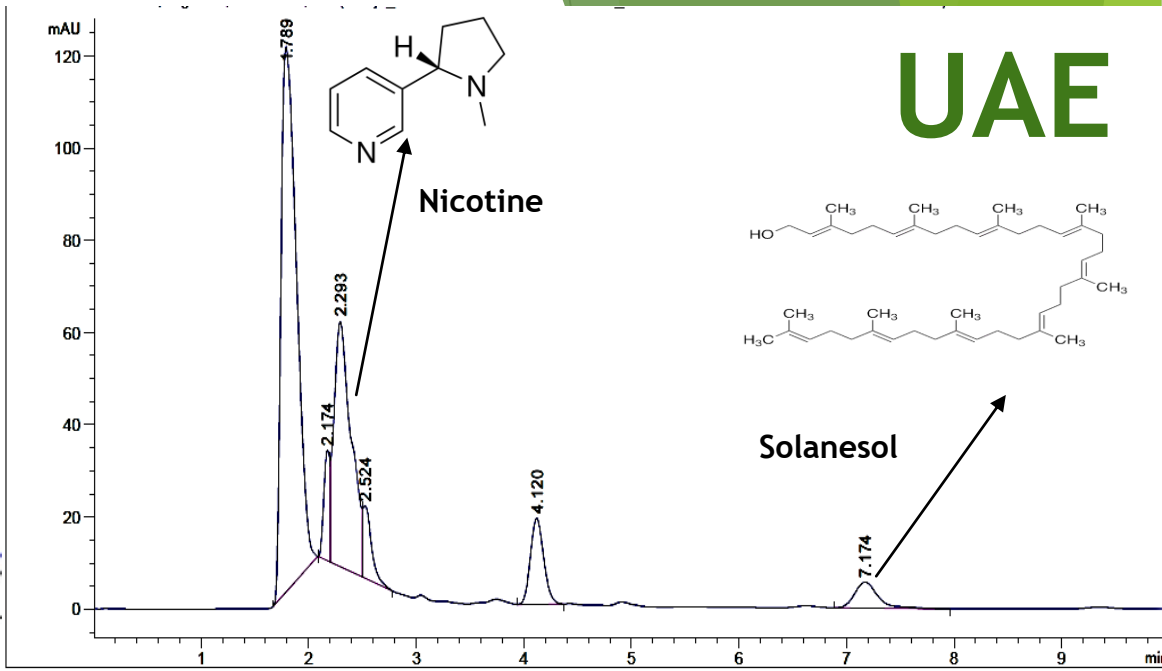
Better extraction efficiency

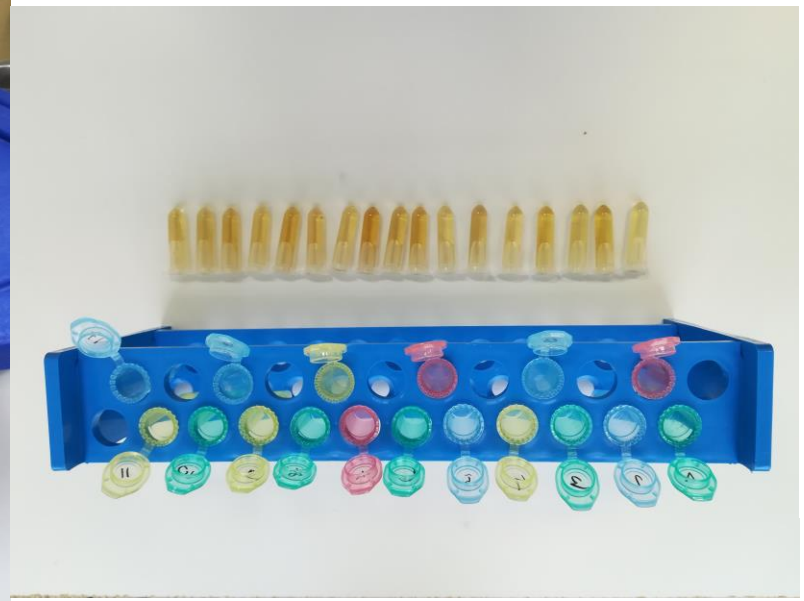
Easy to use

Cheap

Scale up







molecules

MDPI

Article

Optimization of Ultrasound-Assisted Extraction of Some Bioactive Compounds from Tobacco Waste

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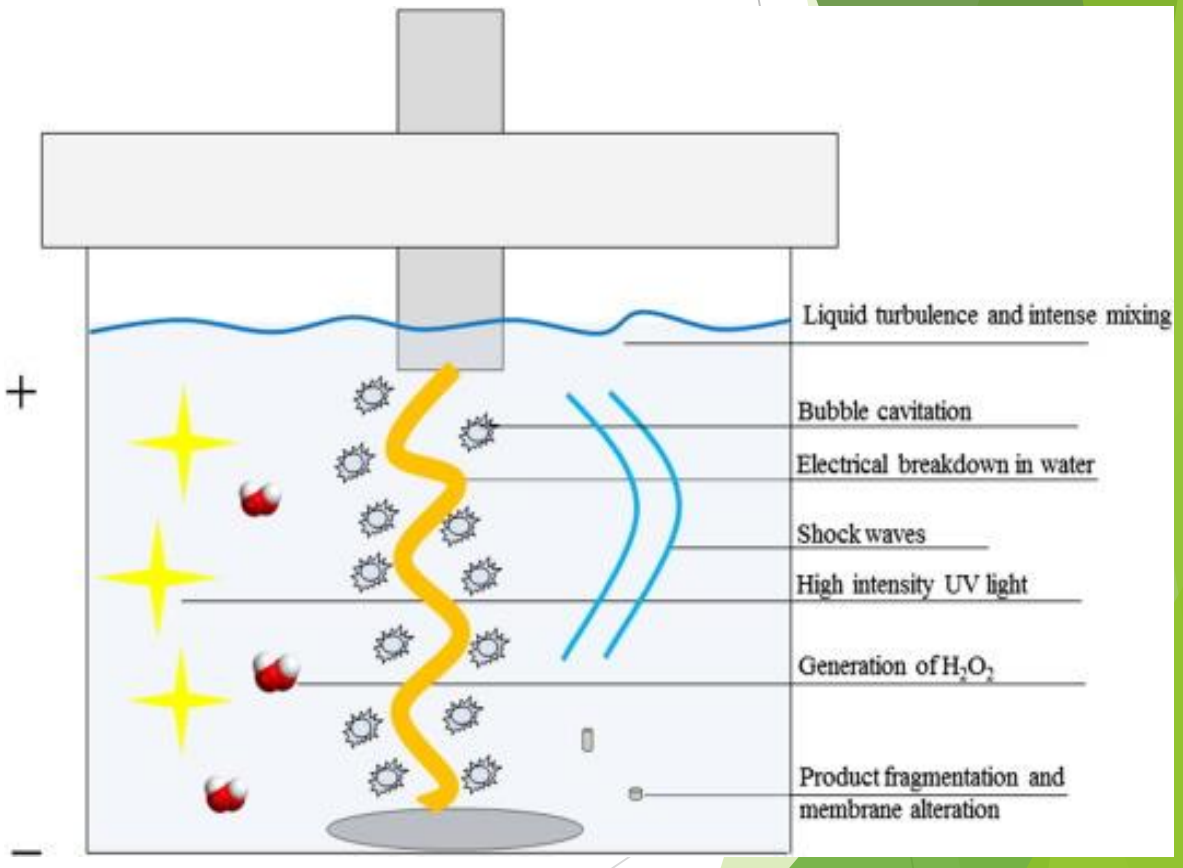
HIGH VOLTAGE ELECTRIC DISCHARGE EXTRACTION

ADVANTAGES

- Higher extraction rate
- Shorter time
- Lower temperatures
- Preservation of the most thermolabile compounds

DISADVANTAGES

- Solid to liquid separation step is difficult
- Electrical discharges can produce chemical electrolysis and free radicals

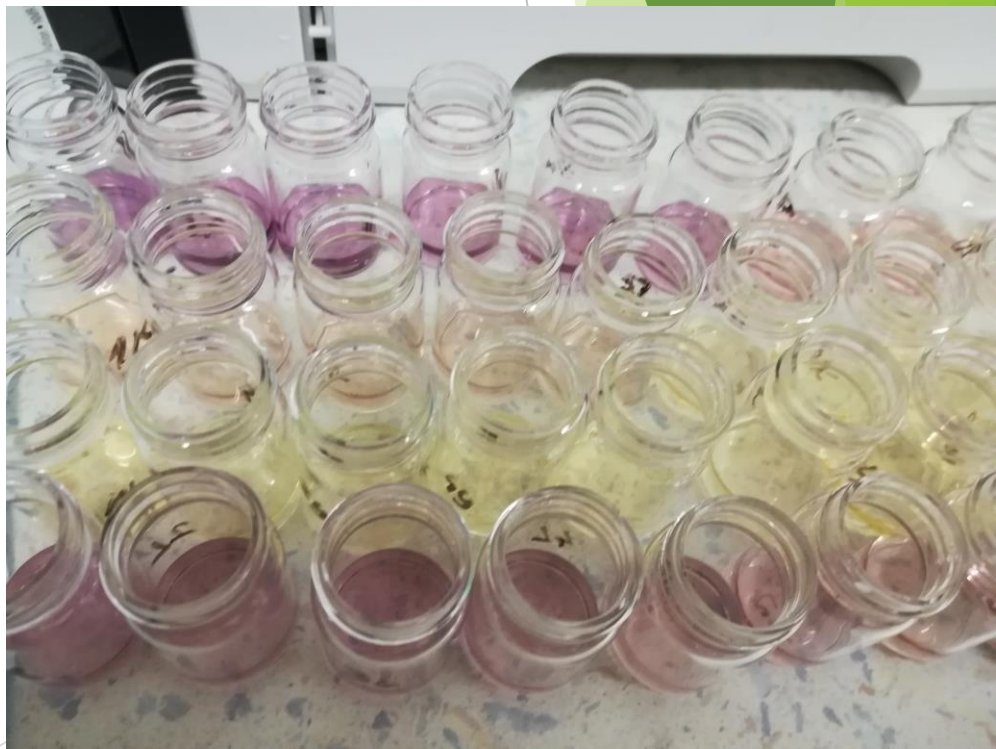


HVED

- Extraction time (15, 30, 60 min)
- Frequency (40, 70, 100 Hz)
- Solvent-solid ratio (300, 500, 700 mL/g)

FUTURE?!

- Microwave assisted extraction
- Extraction with deep eutectic solvents
- Production od dry extracts
- Isolation of selected bioactive compounds



Thank you for your attention!

Visit us on: http://www.ptfos.unios.hr/ByProExtract/

This work has been supported by Croatian Science Foundation under the project "Application of innovative techniques of the extraction of bioactive components from by-products of plant origin" (UIP-2017-05-9909).

hrzz Croatian Science Foundation

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