



1-st INTERNATIONAL CONFERENCE: FROM PLANT RESEARCH: FROM PHYTOCHEMISTRY TO PHYTOACTIVITY

21 APRIL 2023



**ALBANIAN MELISSA OFFICINALIS, A STUDY OF THE ESSENTIAL OIL
PROFILE OBTAINED BY THE SC-CO₂ EXTRACTION**



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300 days of sun per year





Albanian MELISSA OFFICINALIS

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INTRODUCTION

In Albania, *Melissa Officinalis* is also known as a **bee herb**, this herb is still used today against nervous irritations, problems with insomnia, digestion, and urinary spasms. The essential oils of bee grass contain substances that relax the muscles, especially the bladder, stomach, and uterus.

Prominent European scientific organizations cite bee herb's abilities to internally cure mood swings, anxiety, digestive problems, and cold sores when applied externally.

The use of bee herb as a tea has also received the German license to be used against *sleep disorders*, curing problems in the *gastrointestinal tract*, and stimulating the appetite.

Bee grass is consumed as a tea, but its leaves can also be added to salads and consumed fresh. The plant has mild, soothing, and antispasmodic properties. It also helps soothe the gastrointestinal tract from bloating, inflammation, and gas. ***It is worth noting that the plant also helps to stimulate the production of digestive enzymes by the liver, thus helping the digestion of food.*

Bee grass eases stool and helps remove mold in the intestines.



CHARACTERISTICS OF THE ALBANIAN MELISSA OFFICINALIS



Name	Bee Balm
Scientific Name	Melissa Officinalis
Native	Europe, Central Asia, and Iran.
Common/English Name	lemon balm, bee balm, honey balm
Name in Other Languages	Albanian : Bar i bletës
Origine of the plant:	Gjinar, Elbasan.
Cultivation	collected by the harvesters from May to June
Major Nutrition*	Melissa officinalis contains essential oil (it contains citroneral, citral, linalool, geraniol and aldehydes), flavonoids, apigenin, luteolin, tannins, sesquiterpenes, caffeic acid, chlorogenic acid, rosmarinic acid, polyphenolics

CHARACTERISTICS OF THE ALBANIAN MELISSA OFFICINALIS

HEALTH BENEFITS

As infusion

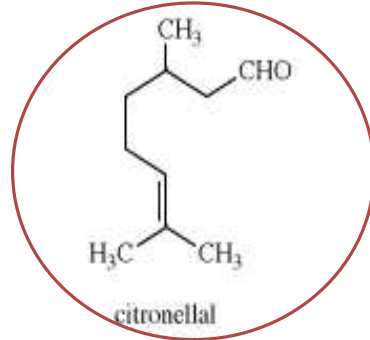
- ⑩ digestive,
- ⑩ diaphoretic,
- ⑩ sedative,
- ⑩ antispasmodic,
- ⑩ anti-inflammatory,
- ⑩ antimicrobial
- ⑩ sedative.

In folk medicine

- stomach and duodenal ulcers,
- kidney and liver colic,
- dyspepsia
- vomiting during pregnancy
- headaches,
- dental pain,
- edema
- skin wounds

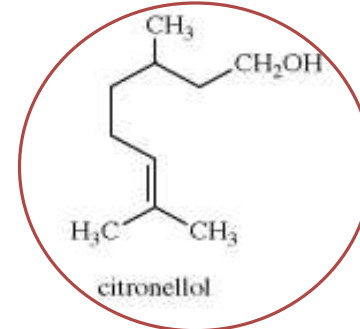
Recent studies suggest that the plant extract enhances memory and can be effective against amnesia and Alzheimer's disease. These effects may be attributed to the AchE Inhibitory activity or to nicotinic receptor activity.

3 major active substances of the *Melissa Officinalis*



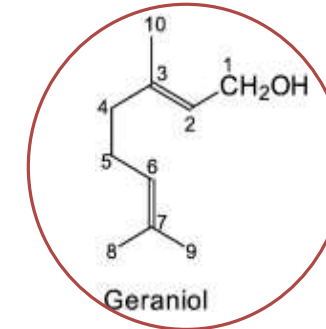
It is a monoterpenoid, which gives the lemon aroma.

It has a role as a antifungal metabolite.



It is monoterpene alcohol.

antibacterial, antidepressant, antiseptic, antispasmodic, anti-inflammatory, deodorant, diaphoretic, diuretic etc



It is a monoterpenoid and alcohol.

Antimicrobial activity → strong inhibitory effect on many bacteria and fungi
Antioxidant activity → Antioxidant effect of GE in different in vitro models indicates the potential benefit of GE against oxidative stress (OS), a progressive pathological feature of neurodegenerative disorders.





- ❑ The apparatus comes with two separators where the CO₂ is removed from the extract before being recycled and two or more extractors that work above the CO₂'s critical pressure.
- ❑ The temperature and pressure of the carbon dioxide gas are increased until they reach the supercritical state as the first step in the supercritical CO₂ extraction procedure.
- ❑ **At a temperature of 31.1 °C and a pressure of 1071 psi (72.87723 atm), carbon dioxide reaches a supercritical state.**
- ❑ To do this, a heater and a high-pressure pump are employed. There is a lot of organic raw material in the extractors that the supercritical CO₂ passes through.
- ❑ The supercritical CO₂ removes the oils from the plant (*Melissa officinalis*) and passes through a series of pressure-regulating valves before entering the separators. The separator's two pressures are independently adjusted to separate the various extract components.
- ❑ The CO₂ is recycled by condensing and storing it as a liquid in the tank after the oil is removed and separated from the CO₂ that is released as gas.
- ❑ The oil is then collected in collection containers. The entire cycle is then repeated by utilizing this CO₂ throughout the batch.

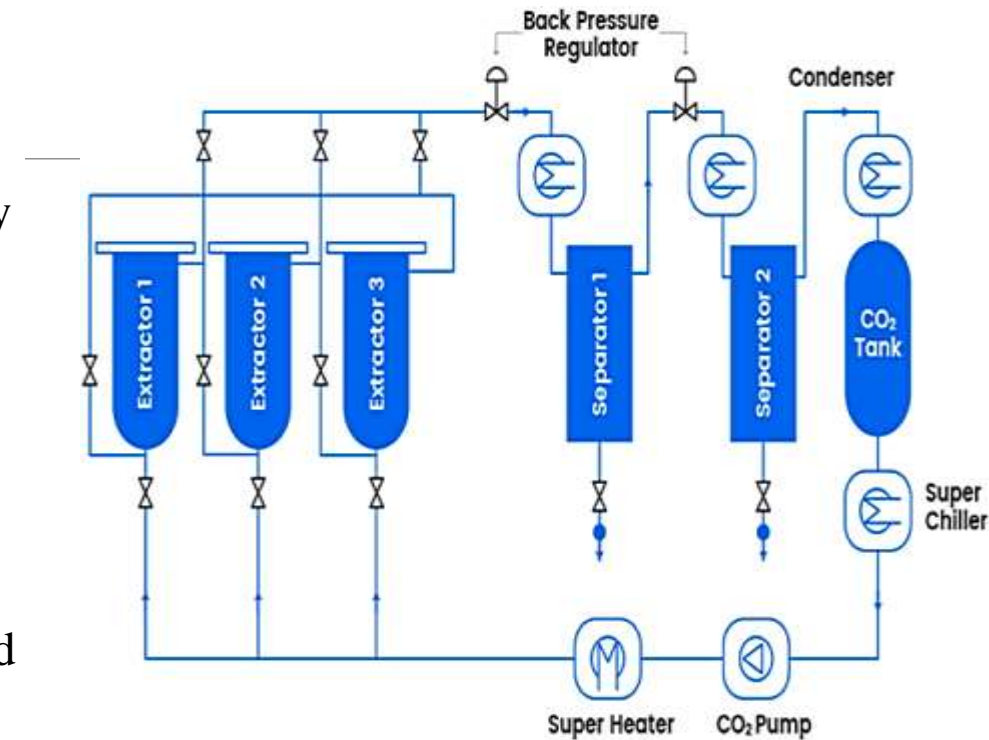


Figure 1. The Supercritical CO₂ extraction apparatus.



MATERIALS AND METHODS

- ❑ From May to June, harvesters in Gjinar Village, the plant was cultivated.
- ❑ The integrity and health of the plant are evaluated using a humidity monitor and a microscope. Regarding the current state of production: The plant particle size used is 0.3 mm by SCFE (supercritical fluid extraction) technology SC- CO₂ extraction
- ❑ The extraction of solids from ground materials (or pellets, granulates) is frequently carried out in batch mode utilizing food carbon dioxide as a solvent.
- ❑ After obtaining the entire CO₂ extract, the extract is diluted with n-hexane in a ratio of 1:2 before being used for analysis.
- ❑ GC- FID was used for the determination of the components.
- ❑ UV – VIS spectrophotometer was used for the identification of heavy metals
- ❑ Microbiological analysis.



Figure 2. The Supercritical CO₂ extraction apparatus while performing in the laboratory.



No.	Compound	%
1	b- Pinene	0.68
2	Artemiseole	1.39
3	Ocinene	2.55
4	Geraniol	6.18
5	Linalol	1.35
6	b-Caryophyllene	7.76
7	Ocimene	4.67
8	Methyl Geranele	4.62
9	E- Citral	6.64
10	Isopulegone	2.45
11	Citronellol	14.86
12	Z-Citral	3.99
13	Citronellal	39.41
14	Humulene	2.24
15	Germacrene	1.2

RESULTS AND DISCUSSION

PUBMED: Protective Effects of (*E*)- β -Caryophyllene (BCP) in Chronic Inflammation,

[Rosaria Scandiffo](#),^{1,2} [Federica Geddo](#),¹ [Erika Cottone](#),¹ [Giulia Querio](#),¹ [Susanna Antoniotti](#),¹.

b-Caryophyllene help relieve anxiety and pain, reduce cholesterol, prevent Osteoporosis, and treat seizures

E- citral (an anti-inflammatory, antibacterial, citral showed an important antioxidant activity, etc

PUBMED: “Biological properties of citral and its potential protective effects against cytotoxicity caused by aspirin in the IEC-6 cells”[Hafsia Bouzenna](#)¹, [Najla Hfaiedh](#)², [Marie-Agnès Giroux-Metges](#)³, [Abdelfattah Elfeki](#)⁴, [Hélène Talarmin](#)³

Table 2. GC- FID analysis of Melissa Officinalis CO₂ Total Extract.



RESULTS AND DISCUSSION

Table 3. The physical-chemical analysis of Melissa Officinalis. Heavy metals detection.

HEAVY METAL TESTS	SPECIFICAT IONS	RESULTS	METHOD
Lead (Pb)	≤5.0 ppm	0.27 ppm	ISO 11212 Spectrofotometry
Cadmium (Cd)	≤1.0 ppm	0.02 ppm	
Arsenic (As)	≤1.5 ppm	0.03 ppm	
Mercury (Hg)	≤0.1 ppm	< 0.05 ppm	

Table 4. The microbial analysis of Melissa Officinalis.

MICROBIAL ANALYSIS	RESULTS	SPECIFICATIO NS	METHOD
<i>Bacterial Count</i>			
Staphylococcus aureus	CONFORMS	< 1000 CFU/g	ISO 21149
Escherichia coli	CONFORMS	< 1000 CFU/g	
Pseudomonas aeruginosa	CONFORMS	< 1000 CFU/g	
<i>Yeast and Mould</i>			
Candida albicans	CONFORMS	< 100 CFU/g	ISO 16212
Aspergillus fumigatus	CONFORMS	< 100 CFU/g	



CONCLUSION

1. According to GC- FID analysis of *Melissia Officinalis*, CO₂ Total Extract, the main active ingredients are: **Citronellal 39.41%, Citronellol 14.86%, and Geraniol 6.18 %**. As a result of whom the bee balm has a variety of beneficial effects.
2. By employing spectrophotometry, ISO-11212 Spectrophotometry was able to identify the presence of heavy metals. These results show that the levels of these metals in plants and vegetables are within **WHO standards**. **Lead 0.27 ppm** and **arsenic 0.03 ppm** were the two most abundant heavy metals.
3. Microbial analyses are **negative** for the presence of various bacteria and yeast and moulds.
4. Supercritical CO₂ extraction has a variety of advantages, some of which we can list below
 - Compared to oil products made using the steam distillation process, CO₂ extraction oil products are more pure and superior in quality.
 - The CO₂ extracts have an advantage over steam distillation in that heating **does not destroy** the elements in the material while the essential oil is being extracted.

This means that while using CO₂ total extracts, you are utilizing both the plant's essential oil and additional components that were also supercritically extracted using CO₂.



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A SPECIAL THANKS TO:

Dr. Lorena Memushaj

MSC. Ina Xhangoli and MSC. Griselda Zacaj

[Herbal products manufactory |
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MSC. Lindita Vrushi

**THANK YOU FOR YOUR
ATTENTION**