The 8th International Electronic Conference on Medicinal Chemistry (ECMC 2022)
01–30 NOVEMBER 2022 | ONLINE

Basil (*Ocimum basilicum* L.) cultivated in Serbia: antioxidant and antibacterial activity of essential oil and extracts

Chaired by DR. ALFREDO BERZAL-HERRANZ;
Co-Chaired by PROF. DR. MARIA EMÍLIA SOUSA

pharmaceuticals MDPI

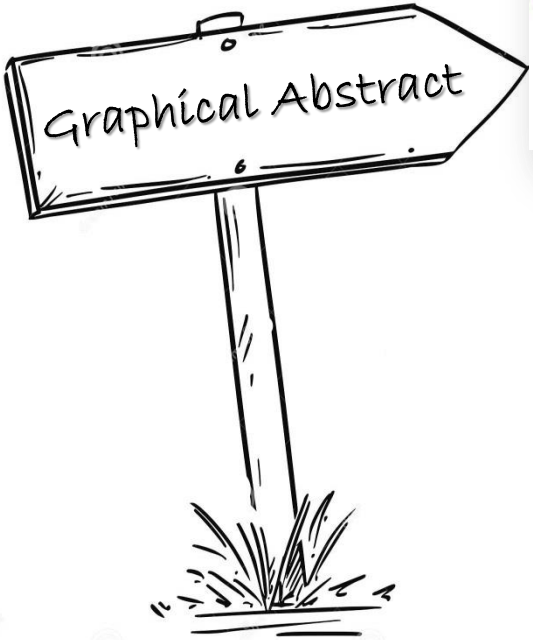
Aleksandra Stojićević[1,*], Ana Alimpić Aradski[2], Milena Pantić[3] and Mališa Antić[3]

[1] The Academy of Applied Technical Studies Belgrade, College of Applied Engineering Sciences, Nemanjina 2, 12000 Požarevac, Serbia;
[2] University of Belgrade, Faculty of Biology, Institute of Botany and Botanical Garden "Jevremovac", Takovska 43, 11000 Belgrade, Serbia
[3] University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia

[*] Corresponding author: a.ilic.vts@gmail.com

AKADEMIJA TEHNIČKIH STRUKOVNIH STUDIJA BEOGRAD

Basil (*Ocimum basilicum* L.) cultivated in Serbia: antioxidant and antibacterial activity of essential oil and extracts



Hydrodistillation → Essential oil (EO)

Extraction → Basil extracts (BEs)

Basil extracts (BEs) → Total phenolic content (TPC)
Total flavonoid content (TFC)

Basil extracts (BEs) → Antioxidant activity
- ✓ DPPH
- ✓ FRAP

Antibacterial activity
- *E. coli*
- *S.* Typhimurium
+ *S. aureus*
+ *L. monocytogenes*

ECMC 2022
The 8th International Electronic Conference on Medicinal Chemistry
01–30 NOVEMBER 2022 | ONLINE

Abstract

Basil (*Ocimum basilicum* L.) has a long traditional use as spice in both folk and conventional medicine. Basil **extracts** (BEs) as well as **essential oil** (EO) represents a rich source of phytochemicals, many of which possess diverse biological activities. The objectives of this study were to assess antioxidant and antibacterial activities of BEs and EO, obtained from plants cultivated in Republic of Serbia. EO was isolated by hydrodistillation, while BEs were obtained by Soxhlet extraction and **ultrasound-assisted maceration**, using **70% and 96% ethanol**. In prepared BEs total phenolic (TPC) and total flavonoid content (TFC) were determined spectrophotometrically. Antioxidant activity was evaluated by DPPH and FRAP assays. A higher TPC was obtained using 70% ethanol, while 96% ethanol proved to be more effective for the extraction of flavonoids.

In both antioxidant assays, BEs showed remarkable antioxidant properties compared to EO. Also, regardless the extraction method and assay applied, the 70% ethanol extracts proved to be more potent than 96% ethanol ones. Both antioxidant assays strongly correlated with TPC than with TFC. For antibacterial activity assay, minimal inhibitory concentrations (MIC) and minimal bactericidal concentrations (MBC) were obtained by the microdilution method. Tested Gram-negative bacteria (*E. coli* and *S.* Typhimurium) were more resistant than Gram-positive (*S. aureus* and *L. monocytogenes*). Opposite to results of antioxidant activity, EO expressed superior antibacterial activity. Based on the obtained results, it can be concluded that **basil represents powerful source of biologically active components which can express strong antioxidant and antibacterial activity.**

Keywords: basil, essential oil, extract, biological activity

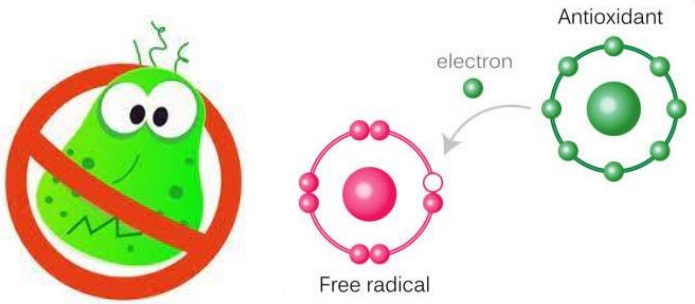
Introduction

- The **Lamiaceae** family include **medicinal plants** and **spices** widely used as food ingredients as well as home remedies in the treatment of different diseases.

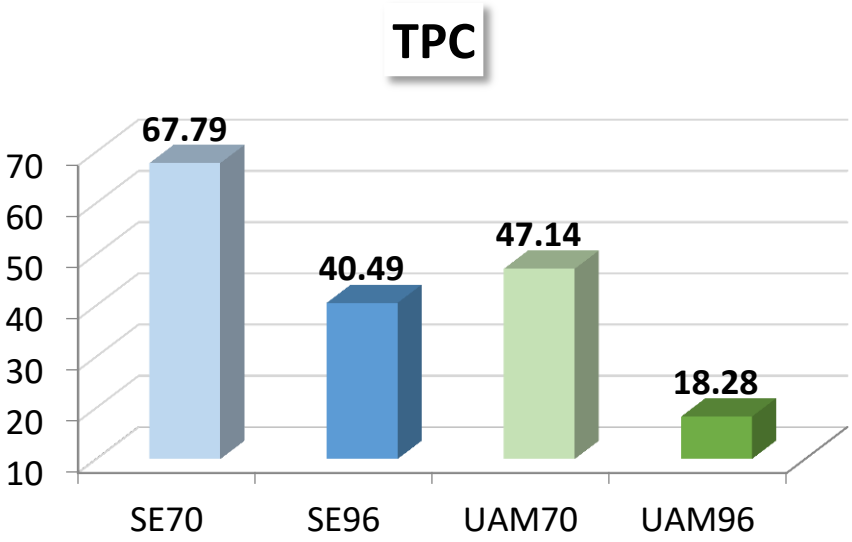
- **Basil** is a widely known member of Lamiaceae family which has been grown traditionally as a decorative, medicinal, seasoning and ritual herb.

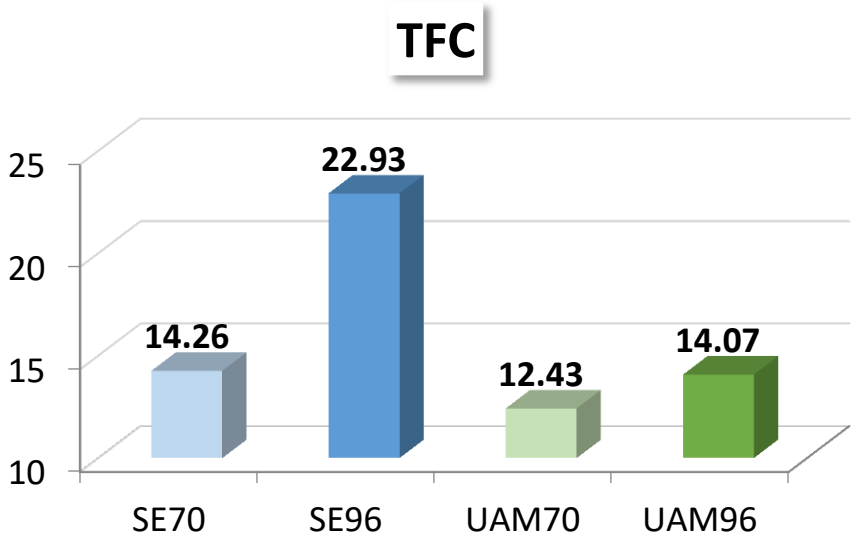
- Numerous studies have confirmed the significant biological activity of basil extracts and essential oils, including **antioxidant** and **antibacterial**.

- The aim of this study was to assess antioxidant and antibacterial activities of BEs and EO as well as total phenolic and flavonoid content in prepared BEs.



Results and discussion



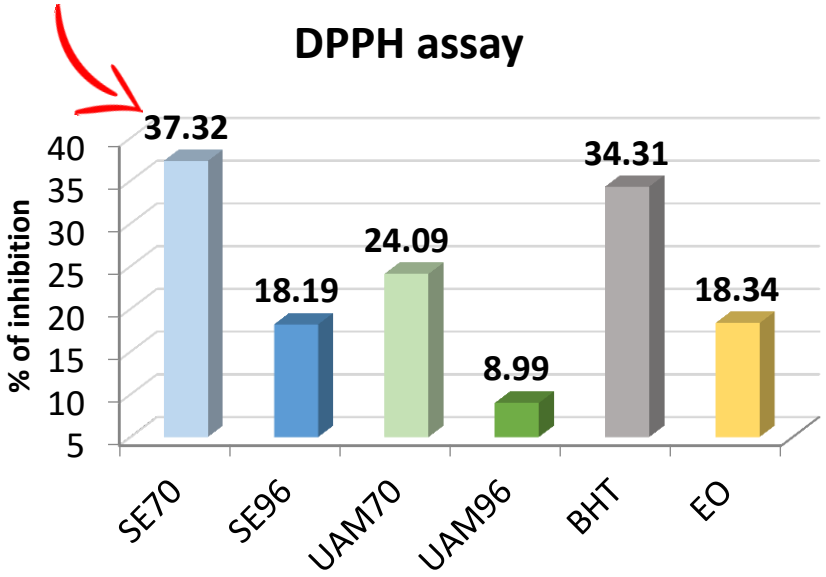


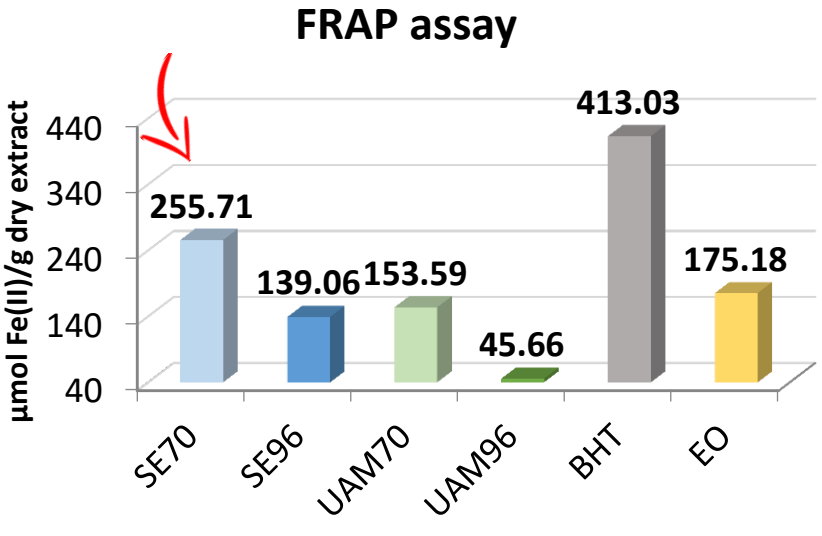
- A higher TPC was obtained using 70% ethanol.
- 96% ethanol proved to be more effective for the extraction of flavonoids.

SE70 – extract obtained by Soxhlet extraction with 70% ethanol
SE96 - extract obtained by Soxhlet extraction with 96% ethanol
UAM70 - extract obtained by ultrasound-assisted macertion with 70% ethanol
UAM96 - extract obtained by ultrasound-assisted macertion with 96% ethanol

*concentration of the tested extracts and standards was 0.1 mg/mL

Results and discussion





- In comparison to control – sinthetic antioxidant BHT, only SE_{70} extract has achived significant antioxidant activity.
- UAM96 was the weakest extract.
- In both antioxidant assays, BEs showed remarkable antioxidant properties compared to EO, even it was tested in higher concentration.
- Also, regardless the extraction method and assay applied, the 70% ethanol extracts proved to be more potent than 96% ethanol ones.

*concentration of the tested extracts and standards was 0.1 mg/mL; EO was tested in concentation of 5 mg/mL.

Results and discussion

BE / EO	G (+) bacteria				G (-) bacteria			
	S. aureus ATCC 25923		*L. monocytogenes* ATCC 1911		*E. coli* ATCC 25922		*S. enterica ser.* Typhimurium ATCC 14028	
	MIC*	MBC*	MIC	MBC	MIC	MBC	MIC	MBC
SE_{70}	0.156	0.156	5.0	5.0	10.0	10.0	5.0	10.0
SE_{96}	0.313	0.313	10.0	10.0	20.0	20.0	20.0	40.0
UAM_{70}	0.313	0.625	20.0	20.0	20.0	40.0	10.0	40.0
UAM_{96}	0.313	1.250	0.313	0.313	10.0	10.0	10.0	10.0
EO	0.078	0.313	0.313	1.250	5.0	>5	5.0	5.0

- Tested Gram (-) bacteria were **more resistant** than Gram (+).
- *S. aureus* **was the most sensitive** of all tested bacteria.
- Although the BEs showed significant inhibitory activity, the **EO proved to be a superior antibacterial agent.**

Conclusions

- ✓ BEs showed remarkable antioxidant properties compared to EO.
- ✓ The 70% ethanol extracts proved to be more potent antioxidant than 96% ethanol ones.
- ✓ Both antioxidant assays strongly correlated with TPC.
- ✓ Opposite to results of antioxidant activity, EO expressed superior antibacterial activity.
- ✓ Basil represents powerful source of biologically active components which can express strong antioxidant and antibacterial activity

Acknowledgments

The authors are grateful to the Ministry of Education, Science and Technological Development of Republic of Serbia (No: 451-03-68/2022-14/200178) for the financial support

Република Србија
МИНИСТАРСТВО ПРОСВЕТЕ,
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА

and
the Institute for Medicinal Plant Research “Dr Josif Pančić” Belgrade for the samples provided for this research.

Institut "Dr Josif Pančić"