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**ENGINEERING, ENVIRONMENT AND MATERIALS
IN PROCESS INDUSTRY
EEM2025**

BOOK OF ABSTRACTS

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BOOK OF ABSTRACTS

IX INTERNATIONAL CONGRESS *ENGINEERING, ENVIRONMENT AND MATERIALS IN PROCESS INDUSTRY*

EEM2025

UNDER THE AUSPICES OF

**MINISTRY OF ECONOMY AND ENTREPRENEURSHIP OF
THE REPUBLIC OF SRPSKA**

AND

ACADEMY OF SCIENCES AND ARTS OF THE REPUBLIC OF SRPSKA

**BIJELJINA, APRIL 02 – 04, 2025
REPUBLIC OF SRPSKA
BOSNIA AND HERZEGOVINA**

PUBLISHER

UNIVERSITY OF EAST SARAJEVO

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ENGINEERING, ENVIRONMENT AND MATERIALS IN PROCESS INDUSTRY

PUBLISHED: 2025

ISBN: 978-99955-81-52-7

The authors have full responsibility for the originality and content of their own papers.

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NON-TREATED AND UV-IRRADIATED *PAEONIA TENUIFOLIA* PETAL EXTRACT-LOADED LIPOSOMES

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Abstract

Paeonia tenuifolia L. petals contain bioactive compounds, such as phenolic acids, flavonoid glycosides and aglycones, anthocyanins, anthocyanidins, terpene derivatives, etc. However, the application of the mentioned bioactives from this source is rather low due to the fact that a higher amount of petals need to be collected in order to obtain a decent amount of these compounds, thus leading to the need for large meadow areas covered only in steppe peony. In addition, Paeonia petal bioactive compounds are characterized by their low solubility, stability, integrity, permeability, and consequently bioavailability. Therefore, the encapsulation of these hard-to-obtain P. tenuifolia petal bioactive molecules into liposomal particles can be advantageous. In the present study, P. tenuifolia petal extract-loaded liposomes were prepared using thin film method and characterized in terms of encapsulation efficiency (EE), vesicle size, polydispersity index (PDI), zeta potential, mobility, and radical scavenging potential before and after UV irradiation. The EE was high and amounted to >75%, while UV irradiation did not influence the mentioned parameter, i.e., UV irradiation did not cause the leakage of encapsulated compounds. The vesicle size was significantly high and amounted to 4959.7 ± 131.2 nm for non-treated and 5030.0 ± 73.6 nm for UV-irradiated liposomes, while the liposomal dispersion system was homogeneous and PDI was 0.252 ± 0.065 and 0.222 ± 0.025 , respectively; the differences were not statistically significant. The zeta potential and mobility for the non-treated sample were -10.93 ± 0.38 mV and -0.857 ± 0.028 $\mu\text{mcm/Vs}$, respectively indicating lower stability of the liposomal system. However, UV irradiation caused a significant change in both parameters and reversal from negative to positive values; namely, the zeta potential was $+7.70 \pm 0.15$ mV, while mobility amounted to 0.604 ± 0.012 $\mu\text{mcm/Vs}$. In the ABTS antioxidant assay, extract-loaded liposomes neutralized $63.1 \pm 1.4\%$ of the ABTS radicals, whereas after UV irradiation antioxidant potential was significantly lower ($55.0 \pm 1.3\%$). On the other hand, UV irradiation did not influence DPPH radical scavenging of the liposomal particle and the IC_{50} value was ~ 10.7 mg/mL in both cases (non-treated and UV-irradiated samples). Future experiments should be focused on the reduction of vesicle size of the obtained liposomes using sonication and/or extrusion and improvement of zeta potential and consequently stability with the aim to implement P. tenuifolia petal extract-loaded liposomes in food, functional food, pharmaceutical, and cosmetic products.

Keywords: *steppe peony, encapsulation, biological activity, encapsulation efficiency.*

SATUREJA MONTANA EXTRACTS: THE IMPACT OF TEMPERATURE IN MICROWAVE-ASSISTED EXTRACTION

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Abstract

Aromatic plants of the Lamiaceae family are valuable food and medicinal sources due to their antioxidant, antimicrobial, antispasmodic, expectorant, carminative, antiulcer, stimulant, anticancer, anti-proliferative, and diuretic effects. Biologically active compounds obtained from plant resources have gained more attention nowadays, due to the consumerism demand for functional food and pharmaceuticals based on natural compounds. In the present study, Satureja montana herba was evaluated as a source of antioxidant polyphenol components, which were extracted by the application of a microwave assisted extraction device. Microwave-assisted extraction has become a good alternative extraction procedure in comparison to traditional techniques due to its high efficiency, faster kinetics, and reduced extraction medium consumption, which is in accordance with the aim of the manufacturing sector to seek out eco-innovative technologies, which minimize the loss of bioactive compounds. Optimization of the extraction was carried out by varying the extraction temperature (60-200°C) in 50% ethanol, at a 1:40 solid-to-solvent ratio for 150 s. The extraction efficiency was expressed in terms of total polyphenol content (TPC), total flavonoid content (TFC), and DPPH radical scavenging capacity (expressed as the IC₅₀, the concentration of the extract requires to neutralize 50% of free radicals). The highest TPC was recorded in the extract prepared at 160°C (1.77±0.14 mg gallic acid equivalent - GAE/g dry extract), while the highest TFC was in the extract obtained at 180°C (0.39±0.01 mg catechin equivalent - CE/g dry extract). Also, the level of polyphenol yield was correlated with free radical scavenging activity and the IC₅₀ value was the lowest (the highest antioxidant activity, 5.30±0.21 mg/mL) in the sample with the highest TPC. This study revealed that polyphenol and flavonoid yields and antioxidant potential of S. montana extracts were significantly affected by the temperature in the microwave-assisted extraction. This is the first step in obtaining the highest amount of bioactive compounds from S. montana that can be used in the food, pharmaceutical, or cosmetic industry, in their free form or encapsulated into adequate carriers.

Keywords: *winter savory, bioactive compounds, extraction optimization.*