FROM WASTE TO BIOACTIVITY: UNLOCKING THE POTENTIAL OF SWEET CHERRY PIT EXTRACTS VIA MICROWAVE AND ULTRASOUND-ASSISTED EXTRACTION

Aleksandra Cvetanović Kljakić[1*], Pavle Mašković[2], Jelena Mašković[2]

[1]University of Novi Sad, Faculty of Technology Novi Sad, Bulevar cara Lazara 1, Novi Sad, Serbia, a.c.istrazivac@gmail.com
[2]University of Kragujevac, Faculty of Agriculture, Cara Dušana 34, Čačak, Serbia, pavlemaskovic@yahoo.com, jelenav@kg.ac.rs

ABSTRACT

Sweet cherry pits, a significant fraction of agro-industrial bio-waste, are often underutilized despite their richness in bioactive compounds. In line with sustainable resource management and circular economy principles, their valorization using green extraction techniques has gained attention. Microwave-assisted extraction (MAE) and ultrasound-assisted extraction (UAE) are advanced methods that allow efficient recovery of bioactive compounds through reduced extraction time, lower solvent use, and enhanced mass transfer. In this study, dried and ground sweet cherry pits were extracted using MAE (70% ethanol, SSR 1:5, 30 min, 600 W) and UAE (70% ethanol, SSR 1:5, 30 min, 40 kHz). Extracts were evaluated for antioxidant, antimicrobial, and cytotoxic activities. Antioxidant potential was assessed using five complementary assays (DPPH, ABTS, OH, lipid peroxidation inhibition, and total antioxidant activity), showing no significant differences between MAE and UAE, with only minor variations. Pronounced differences were observed in cytotoxic activity, where UAE extracts exhibited significantly lower IC_{50} values, indicating stronger antiproliferative effects. This is likely due to ultrasound-assisted extraction favoring thermolabile and highly bioactive compounds. Conversely, UAE extracts displayed markedly weaker antimicrobial activity, with substantially higher MIC values for all tested microorganisms (e.g., *Proteus mirabilis* 625 µg/mL vs. 4.88 µg/mL for MAE; *Staphylococcus aureus* and *Escherichia coli* 312.5 µg/mL vs. 19.53 µg/mL). Overall, MAE proved more effective for antimicrobial activity, while UAE showed superior cytotoxic potential. These results confirm that cherry pits are a valuable source of bioactive compounds and that modern green extraction techniques provide an efficient strategy to convert bio-waste into high-value products with diverse biological applications.

Keywords: Sweet cherry pits, agro-industrial bio-waste, sustainable development, bioactive compounds, micowave extraction, ultrasound extraction.

Acknowledgements

This research was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Programm No#451-03-33/2026-03/ 200134).