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EXTRACTION OF LEMON BALM (*Melissa officinalis* L.) USING NATURAL DEEP EUTECTIC SOLVENTS

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Lemon balm (*Melissa officinalis* L.) is a medicinal plant from the Lamiaceae family of ethnopharmacological importance. Additionally, the medicinal relevance of lemon balm was confirmed in numerous studies that determined its significant biological potential including its antioxidant, antiviral, antifungal, antibacterial, and antiproliferative activities. The most common procedures for obtaining lemon balm-based products involve the use of conventional solvents and methodologies that can be time- and energy-consuming and unfavourable to the environment. Therefore, there is a constant interest in developing new, safe, and efficient approaches to obtaining extracts of lemon balm. Natural deep eutectic systems (NADES) represent natural alternative solvents formed by mixing the hydrogen bond acceptor and hydrogen bond donor at a certain molar ratio. NADES are characterized as highly biodegradable, biocompatible, safe, and low-cost solvents. Considering their safety profile, it is not necessary to remove them from extracts. In this study, NADES (betaine:ethylene glycol (1:3), betaine:glycerol (1:2), and glycerol:glucose (4:1)) were used as solvents in the ultrasound-assisted extraction to obtain extracts of lemon balm. The extraction was conducted at temperatures of 40 and 60 °C and extraction times of 30 and 60 minutes. Furthermore, the obtained extracts were investigated in terms of the content of main polyphenols by applying the HPLC analysis. Dominant compound in the NADES extracts was rosmarinic acid in the range from 163.12 to 2882.82 µg/mL, followed by luteolin-3-O-glucuronide (from 10.50 to 155.26 µg/mL). It was noticed that the contents of rosmarinic acid, luteolin-3-O-glucuronide and luteolin-7-O-glucoside increased with the temperature and extraction time, hence their highest content was obtained in the extract attained under the conditions of 60 °C/60 min with betaine:ethylene glycol. Due to higher viscosity of glycerol:glucose and betain:glycerol mixtures, the mass transfer was decreased causing these solvents to be less efficient for polyphenolic extraction compared to the betaine:ethylene glycol system. The trend of increase in the content of all individual polyphenols with the increase in the extraction temperature and time was also noted in the extracts obtained with glycerol:glucose.

Keywords: Deep Eutectic Solvents, Ultrasound, Polyphenols, Extraction, Lemon Balm.

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