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Entitled

*ENHANCEMENT OF PHENOLIC RECOVERY AND BIOACTIVITY OF DATE PALM LEAF EXTRACT USING
NATURAL DEEP EUTECTIC SOLVENTS AND GREEN EXTRACTION TECHNIQUES*

by

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Abstract

This study was designed to explore date palm leaves, an agro by-product, as a potential source of natural polyphenolic compounds using appropriate green Natural Deep Eutectic Solvent (NADES) and emerging green extraction technologies. Herein, six different NADES were prepared using six different hydrogen donors and choline chloride as hydrogen bond acceptor at a molar ratio of 1:2 (w/w) and different NADES concentration (10, 20, 40, and 80%, in water, at 40 °C). Among the studied NADES, Glycerol-based NADES showed higher phenolic yield compared to saccharide and organic acid-based NADES. Afterwards, to enhance the extraction efficiency, NADES were coupled with microwave (MAE-NADES) and ultrasonication (UAE-NADES) technologies using a 23 factorial design and the effects of different process parameters on total phenolic content (TPC) were analyzed. Interestingly, it was found the UAE was not effective enough to increase the TPC, while MAE was significantly effective in increasing the TPC. Both UAE-NADES and MAE-NADES-based extracts with the highest TPC values were further profiled for phenolic compounds using RP-UPLC, showing Ferulic acid and rutin as the dominant phenolic compounds among the identified compounds. Furthermore, the effect of extraction method on bioactive properties of date palm leave extract, in terms of DPPH and ABTS radical scavenging activities as well as the inhibition of various enzymatic markers involved in diabetes (α -amylase, α -glucosidase, and DPP-IV) and hypercholesterolemia (cholesterol esterase and pancreatic lipase) were evaluated. MAE-NADES-based extracts were shown to possess higher bioactive properties compared to UAE-NADES-based extracts and thus its extraction parameters were further optimized using a Box-Behnken design of Response Surface Methodology (RSM) with three independent factors (microwave power, time, and NADES dilution). RSM predicted that the phenolic extraction can be maximized at a NADES dilution of 49, 800 W for 0.84 min. The current study concludes that application of MAE-NADES green extraction technology can be an effective approach for bioactive compounds recovery from the date palm leaves which is a rich source of natural polyphenolic compounds.

Keywords: Date leaves, NADES, Microwave, Ultrasonication, HPLC, Bioactivity, RSM.