

Metabolites and biological activities of *Phoenix dactylifera* L. pulp and seeds: a comparative MS and NMR based metabolomics approach

ABSTRACT

Phoenix dactylifera L. (date palm) is an essential agricultural crop in many arid regions of the world and has been used in traditional medicine to treat illnesses. Extracts of *P. dactylifera* are reported to possess valuable pharmacological attributes. This study aims to evaluate the metabolite profiles of date pulp and seeds utilizing ¹H nuclear magnetic resonance (NMR) and ultra-high performance liquid chromatography mass spectrometry (UHPLC-MS) techniques. The nitric oxide (NO) inhibitory activity of extracts were assessed using stimulated RAW 264.7 cells along with the NO and DPPH scavenging activities, and total phenolic contents (TPC). Multivariate data analysis (MVDA) was used to examine the similarities and variation between samples of date palms. Principal component analysis (PCA) score plots showed distinct clustering of date seeds and pulp. Examination of the S-plot analysis revealed that ascorbic acid, catechin and glucose were the metabolites that significantly discriminated the date pulp group from the seed group. The seeds of Deglet dates demonstrated significantly higher NO inhibitory and DPPH scavenging activities, with IC₅₀ values of 107.99 µg/mL and 12.58 µg/mL, respectively. The metabolites that prominently contributed to the observed bioactivities included catechin, ascorbic acid and serine. The proposed metabolic pathway indicated that higher amounts of several metabolites are present in date seeds than in date pulp. The presented data suggest possible applications of seeds and pulp of *P. dactylifera* that may increase the productivity of this fruit crop.

Keyword: *Phoenix dactylifera*; Deglet dates; Metabolomics; Date seeds; Date pulps; Nitric oxide