Assessment of *Phoenix dactylifera* Fruits (Date Palm) by using super and subcritical fluids

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1. Introduction:

*Phoenix dactylifera* known as date palm has been widely consumed for long time ago especially in the Arab regions. It is mainly cultivated in the Middle East and Africa, and plays an important role in the society and the economy of those areas\(^1\). For that purpose, date fruit has been largely investigated to emphasize its beneficial impact on health. Large classes of phytochemicals and compounds have been characterized in the edible part of the fruit and the seeds such as polyphenols, carotenoids, sugars, lipids, fibers and minerals. This leads to the different biological activities that date fruit possess (antioxidant, anti-proliferative, anti-inflammatory…). Considering the virtues of date palm their exploitation in pharmaceutical and nutritional fields is needed. Therefore, the techniques used for extracting the functional compounds should be considered as safe such as super and subcritical fluids.

Supercritical fluids extraction is known to provide extracts without toxic residues, without degradation of bioactive compounds and with high quality\(^2\) and its high useful for to isolate non-polar compounds. While pressurized liquid extraction is able to obtain polar and non-polar extracts in a short extraction times. In this case date seed were treated by SC-CO\(_2\) to obtain the oil, while the edible part of dates were treated by pressurized ethanol to obtain the antioxidant fraction.

2. Results and discussions:

From the seeds, oil has been extracted by a supercritical CO\(_2\) and analyzed by GC-MS. To set up the extraction conditions to have the best extract, a chemometric optimization was done. Different ranges of pressure (100-300 bar), temperature (40-80°C) and co-solvent (Ethanol: 0-10%) were chosen, then a statistical analysis by response surface methodology (Figure 1) was done to determine the optimum conditions (100 bar, 40°C and 10% ethanol). The oil of each extract obtained was analyzed by gas chromatography to determine the profile in fatty acids. The main fatty acid found in all the varieties was myristic acid (C14:0). In order to determine the lipid class composition of the oil, the extracts had been analyzed by HPLC-ELSD.

From the pulp the extraction was operated by Pressurized liquid extraction (PLE). The same methodology of optimization has been used; the variables were temperature (50-150°C) and solvent composition (Ethanol 100%, water 100%, water/Ethanol 50%). To get the optimum conditions an antioxidant assay was run and the yield was evaluated and then analyzed by the same method as SFE. The optimum was determined at those conditions of temperature: 150°C and Ethanol: 72%. Then

![Figure 1. Response Surface of yield obtained by SFE within the range studied](image-url)
the phenolic composition of the extracts was analyzed by HPLC-DAD-MS/MS for quantification purposes. The anti-oxidant activity of the extracts has been assessed by performing ABTS and DPPH assays.

3. Conclusions:

The rapidity and the reproducibility of the supercritical CO2 extraction can increase the producibility of the extraction of functional food and also permit to reduce the steps of purification of the extracts and decrease significantly the risk of their contamination by toxic residues from solvents.

Which it’s the case of the date seed oil that can be used as food additive. Besides, it contributed to the valorization of the date seeds that were considered as a waste product.

References
