Journal of the Saudi Society of Agricultural Sciences (2015) xxx, xxx–xxx

King Saud University

Journal of the Saudi Society of Agricultural Sciences

www.ksu.edu.sa
www.sciencedirect.com

FULL LENGTH ARTICLE

Phytochemical compositions and antioxidant capacity of three date (*Phoenix dactylifera* L.) seeds varieties grown in the South East Morocco

Eimad dine Tariq Bouhlali [a,*], Chakib Alem [a], Jamal Ennassir [b], Mohamed Benlyas [a], Addi Nait Mbark [c], Younes Filali Zegzouti [a]

[a] *Department of Biology, Faculty of Science and Technology, Errachidia, Morocco*
[b] *Official Laboratory for Analysis and Chemical Research, Casablanca, Morocco*
[c] *Department of Chemistry, Faculty of Science and Technology, Errachidia, Morocco*

Received 29 July 2015; revised 28 October 2015; accepted 1 November 2015

KEYWORDS

Date seed;
Fatty acids;
Minerals;
Antioxidant

Abstract Three Moroccan date seeds (*Phoenix dactylifera* L.) varieties (*Majhoul*, *Boufgous* and *Bousthammi*) were evaluated for their proximate, phytochemical and nutrient compositions. The crude fiber ranges between 15.84–19.9 g/100 g DW, moisture (4.554–8.259%), protein (4.309–6.144% of DW), ash (1.097–1.3% DW) and fat (5.662–6.972% DW). The most abundant fatty acids of date seed oils as revealed gas chromatography were oleic, lauric, myristic, palmitic and linoleic acids. The physicochemical analysis of date seeds oil shows an acid value between 1.083–1.813 mg KOH/g, saponification value (202.33–222.74 mg KOH/g), peroxide value (1.243–1.01 meq O_2/kg) and iodine value (45.40 and 58.02 g Iodine/100 g). The unsaponifiable matter of date seed oils was found between 0.62% and 1.103%. Among the eight studied minerals potassium, magnesium and calcium were the predominant of macroelement and iron was the predominance of microelement. The antioxidant of date seeds assessed using three assays varied between 10.966–22.86 mmol Trolox equivalent/100 g DW, 4.807–8.021 mmol Trolox equivalent/100 g DW and 0.166–0.112 g/l for FRAP, ABTS and IC50 of DPPH respectively. The phenolic and the flavonoid content of date seeds found changed between 2697–5342 mg Gallic acid equivalent/100 g DW and 1224–1844 mg Rutin equivalent/100 g DW respectively. Results showed that date seeds could be used as ingredients to enhance the nutritional value of some functional

* Corresponding author at: Biochemical of Natural Resources Laboratory, Faculty of Science and Technology, Errachidia 52000, Morocco. Tel.: +212 698984535; fax: +212 535574485.
E-mail address: bouhlali.eimad@gmail.com (E.T. Bouhlali).

Peer review under responsibility of King Saud University.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.jssas.2015.11.002

Please cite this article in press as: Bouhlali, E.d.T. et al., Phytochemical compositions and antioxidant capacity of three date (*Phoenix dactylifera* L.) seeds varieties grown in the South East Morocco. Journal of the Saudi Society of Agricultural Sciences (2015), http://dx.doi.org/10.1016/j.jssas.2015.11.002

foods for human consumption as well as using additives in food, pharmaceutical and cosmetic industries.

1. Introduction

The fruit of the date palm (*Phoenix dactylifera* L.) is one of the important agricultural commodities in the Moroccan Sahara. They are served mainly as a vital component of the diet, staple food and constitute the principal source of remuneration and the basis of economy for the people of these regions. Date seeds represent a major waste material and constitute approximately 6.10–11.47% of the fruit (Habib and Ibrahim, 2009). Date seeds can be discarded, used in animal feeding or used in making non-caffeinated coffee (Habib and Ibrahim, 2009). They are also listed in folk remedies for the management of diabetes, liver diseases and gastrointestinal disorders in traditional Egyptian medicine (Duke, 1992). It has been reported that the extracts of date seeds ameliorate gastric ulceration in rats (Al Qarawi et al., 2005) and possess an anti-inflammatory activity in the rat adjuvant arthritis model (Doha and Al-Okbi, 2004). Salah and Al-Maiman (2005) have reported that feeding the defatted date seed flour to rats reduced the plasma triglycerides, total cholesterol and low-density lipoprotein.

The date fruit seeds contain a wide range of nutritional functional compounds such as fiber, fat, moisture, protein, ash and vitamins as well as high amounts of phenolic (Al-Farsi et al., 2007).

The objectives of this research were evaluated proximate, phytochemical and nutrient compositions of three Moroccan date seeds (*P. dactylifera* L.) Varieties include protein, crude fiber, moisture, ash, minerals, and fat and analyzed the composition on fatty acids, as well as phenolic and flavonoid content and evaluate the antioxidant activities.

2. Materials and methods

2.1. Materials

Date fruit varieties were obtained at Tamr stage from Errachidia National Institute for Agricultural Research.

Chemicals and reagents: The compounds 2,2-diphenyl-1-picryhydrazyl radical (DPPH), 2,2′-azinobis (3-ethylbenzothiazoline-6-sulfonic acid) diammonium salt (ABTS), 2,4,6-tripyridyl-S-triazine (TPTZ), 6-hydroxy-2,5,7,8-tetramethyl chroman-2-carboxylic acid (Trolox), Gallic acid, Rutin, potassium persulfate and fatty acid methyl gas chromatography (GC) standards were acquired from Sigma–Aldrich (Dorset, UK). Folin–Ciocalteu reagent, sodium acetate, and sodium carbonate, sodium hydroxide, sodium nitrite, $FeCl_3{\cdot}3H_2O$, hydrochloric acid, phenol, sulfuric acid and methanol, hexane were from Merck (Germany).

Instruments: Gas chromatograph (Perkin Elmer, Clarus 580, USA), atomic absorption spectrometer (Perkin Elmer, AAnalyst 200 Model, USA), Spectrophotometer (RAYLEIGH, VIS-723G, china), Pulverisette 15 cutting mill (Fritsch, Germany).

2.2. Physical properties of date seeds

Ten date fruits were taken randomly from each variety to determine seed/date fruit weight ratio and dimensions (length and diameter).

2.3. Preparation of date seed powder

The seeds were directly isolated from three date fruits named locally *Bousthammi*, *Majhoul* and *Boufgous*. The seeds of each variety were separately washed, dried and grounded into a fine powder using Cutting Mill.

2.4. Proximate composition of date seeds

Total nitrogen was determined by the Kjeldahl method (AOAC, 1997) and then the protein amount was calculated using a factor of 6.25. The moisture was determined by oven-drying at 105 °C to constant weight (AOAC, 1997). Total sugar content was determined using the method of Dubois et al. (1956). Crude fiber was determined using AFNOR NF-V 03-040, 1977.

2.5. Determination of energy value

The energy values of dates, varieties were evaluated using the formula described by Crisan and Sands (1978).

$$\text{Energy value(kcal/100 g)} = (2.62 \times \%\ \text{protein}) + (8.37 \times \%\ \text{fat}) + (4.2 \times \%\ \text{carbohydrate})$$

2.6. Extraction of date seed fats

The seed lipids of each variety were extracted in a soxhlet apparatus using n-Hexane as a solvent for 8 h. The solvent was removed using a rotary evaporator at 40 °C and the lipids were weighed and stored in a freezer at 4 °C until analysis.

2.7. Physicochemical characteristics of oils

The acid value, saponification value, peroxide value and unsaponifiable matter of the seed oils were determined according to the AFNOR methods such as AFNOR NFT 60-204, AFNOR. T60-206, AFNOR NFT 60-220 and AFNOR NFT 60-205 respectively. The iodine value was determined using AOCS Cd Id-92.

2.8. Fatty acid analysis

The preparation of fatty acid methyl esters was done using transesterification with methanolic potassium hydroxide. The

Please cite this article in press as: Bouhlali, E.d.T. et al., Phytochemical compositions and antioxidant capacity of three date (*Phoenix dactylifera* L.) seeds varieties grown in the South East Morocco. Journal of the Saudi Society of Agricultural Sciences (2015), http://dx.doi.org/10.1016/j.jssas.2015.11.002