**Preliminary photochemical standardization of two types of dates: 'INDIAN AND IRAQUI DATES'**

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**INTRODUCTION**

The beneficial effects of fiber consumption in protection against heart disease and cancer, normalization of blood lipids, regulation of glucose absorption and insulin secretion and prevention of constipation, has led scientists to study and characterize different sources of dietary fiber (1-4). Dietary fiber is defined as lignin plus the polysaccharide components of plants which are indigestible by enzymes in the human gastrointestinal tract [5]. The components of dietary fiber include cellulose, hemicellulose, pectins, hydrocolloids and lignin. These components are typically divided into two categories. Soluble dietary fiber is those components that are soluble in water and includes pectic substances and hydrocolloids. Good sources of soluble fibers include fruits, vegetables, legumes, soybeans, psyllium seeds and oat bran.

Insoluble dietary fiber is those components that are insoluble in water and includes cellulose, hemicellulose and lignin. Whole grains are good sources of insoluble fiber [6]. Supplementation has been used to enhance fiber content of foods. Traditionally, fiber supplementation has focused on the use of milling by-products of cereal grains. All of the milling by-products of wheat, corn, sorghum and other grains, as well as the by-products from the wet milling of corn and wheat, have been investigated as possible fiber supplements [7].There are many other sources of dietary fiber, however, such as fruits, vegetables and less commonly used cereals and seeds such as barley and date seeds, which are potential sources of dietary fiber supplements as described in

the excellent review by McKee and Latner [8]. The aim of this review is an attempt to introduce the underutilized and potential sources of dietary fiber with emphasize on date seeds as cheap and high nutritional value source to be used as dietary fiber supplement.

## MATERIALS AND METHODS

### MATERIAL

Date palm seeds of the following varieties; Khalas, Barhe, Lulu, Shikat alkahlas, Sokkery, Bomaan, Sagay, Shishi, Maghool, Sultana, Fard, Maktoomi, Naptit saif, Jabri, Kodary, Dabbas, Raziz, and Shabebe, were used in this study. All 18 varieties were obtained at the “tamr” stage (fully ripe dates), from a well-known commercial date pack house in the UAE (Al Ain Dates Factory) and were subjected to uniform harvest and post-harvest treatments [10]. The summer season is when the tamr is collected, and it is usually spread over a period of 2–3 months, i.e. the industry receives freshly harvested tamr batches over a 2-3- month period. With no preference to size, color, appearance or firmness, 5 kg from each of the seed varieties were collected randomly from tamr batches at the end of the season and were analyzed. After collection, the seeds were soaked in water, washed to get rid of any adhering date flesh, and then air-dried. Date seeds of each variety were separately ground to powder form in a heavy-duty grinder (IKA M 20 Universal Mill; IKA werke GmbH Co. KG, Staufen, Germany), and each sample was estimated in triplicate.

### METHODS

**Extraction:** The extraction of antioxidant compounds from 18 date seed varieties was carried out using methanol/$H_2O$ (50:50, v/v). T he date palm seed variety sample (1 g) was extracted using 40 mL methanol/$H_2O$ (50:50, v/v).

**Nutritional composition** Protein content: Total protein was determined by the Kjeldahl method. Protein was calculated using the general factor. Fat content: Fat was measured by extracting with light petroleum ether and then removing the solvent by distillation. The residue was dried at 37° C and the fat content determined gravimetrically. Dietary fiber: Determination of dietary fiber was carried out using the AOAC enzymatic gravimetric official method. Micronutrients composition: The levels in different minerals including Calcium (Ca), Phosphorus (P), Potassium (K), Magnesium (Mg), Iron (Fe), and zinc (Zn) were measured. Samples were prepared for the determination of minerals as described by Heckman.

**Antioxidant properties** Total phenolics content: Total phenolics were evaluated using the spectrophotometric analysis with Folin Ciocalteu's phenol reagent according to Kim [14]. The standard curve for total phenolics was made using gallic acid standard solution (0–100 mg/L) and total phenolics were expressed as mg of gallic acid equivalent (GAE)/100 g of date seed. Total flavonoids content: Total flavonoids were determined using the method of Zhishen [15]. An aliquot (250 µl) of each extract or standard solution was mixed with 1.25 ml of $H_2O$ and 75 µl of 5% $NaNO_2$ solution. After 6 min, 150 µl of 10% $AlCl_3$ solution was added. After 5 min, 0.5 ml of 1 M NaOH solution was added and then the total volume was made up to 2.5 ml with $H_2O$. The absorbance against blank was read at 510 nm. The results were expressed in terms of mg rutin equivalent (RE)/100 g date seed.

(+)-Catechin and (-)-Epicatechin contents: Determination (+)-catechin and (-)-epicatechin in date seeds extracts was performed according to the method of Satoh [16]. In brief, high-performance liquid chromatography equipped with 125 binary HPLC pump, 2475fluorescence detector, 717 plus auto sampler and inline degasser AD was used (Waters Corporation, Milford, MA., USA). Reversephase separation was carried out using symmetry C18, 5 µm, and 4.6x150 mm column,

equipped with a C18 pre-column. An 15-min isocratic elution was performed using mobile phase of 9% acetonitrile and 2% acetic acid with flow rate of 1ml/min. Detection was carried out using fluorescence detector set at λEX= 280nm and λEM= 315 nm. Catechin and epicatechin were quantified by external standard method. Plotting concentration (µg/mL) to peak area was set up by the calibration graphs.

Total antioxidant capacity: The total antioxidant capacity (TAC) of date seeds extracts was investigated according to the method of Prieto [17]. In brief, 0.1 ml of date seed extract was mixed with 0.3 ml of the reagent solution (0.6 M sulphuric acid, 28 mM sodium phosphate and 4 mM 5 molybdate). The tubes were capped and the reaction mixture then incubated for 90 min at 95°C. The absorbance of the cooled mixture was measured at 695 nm against a blank. The blank contained the reagent solution and solvent. TAC was expressed as the absorbance of the sample. The higher absorbance value indicated higher antioxidant activity.

**RESULT AND DISCUSSION**

Nutritional characteristics: the level of different macro and micro nutrients (protein, fat, dietary fibers, calcium, potassium, phosphorus, magnesium, iron and zinc) Antioxidant and color characteristics: Polyphenols content (total phenols, total flavonoids, catechin and epicatechin). On average, the phenolic content was 3411.81 ± 717.41 mg GAE/100 g, with Khodary variety having the highest total phenolic content (4768.87 mg GAE/100g seeds), and Barhe variety having the lowest phenolic content (1864.82 mg GAE/100 g seeds).

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