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SOME PHYSICO-CHEMICAL PROPERTIES OF DATE FRUIT VARIETIES

SUMMARY

In this study, some physico-chemical properties of date fruits were determined. Moisture contents of date pulp ranged between 13.43% (Khalas) and 16.17% (Sugei). Fat content of date pulp was found from 0.32% (Sugei) to 0.38% (Sukary), crude oil of seeds ranged 4.35% (Sugei) to 4.51% (Khalas). Sucrose and reducing sugar contents of date pulp were 57.17% and 42.83 % for Sukary, 0.59 % and 99.41 % for Khalas and 1.13% and 98.86% for Sugei, respectively. 'L' values ranged between 49.93 (Khalas) and 50.69 (Sukary), while 'a' values varied between 12.12 (Sugei) and 12.61 (Khalas). The date pulp oil contain from 15.86% (Sugei) to 24.16% (Khalas) palmitic acid, from 5.99% (Sugei) to 9.3% (Khalas) stearic, 23.88% (Sukary) to 27.31% (Sugei) oleic acid, from 30.1% (Khalas) to 35.99% (Sugei) linoleic acid, and from 10.7% (Khalas) to 14.8% (Sugei) linolenic acid.

Keywords: date, seed, fatty acid, total phenolics, antioxidant activity

INTRODUCTION

The date (*Phoenix dactylifera* L.) has been an important crop in the desert region of Arabian countries (Mohammed et al., 1983; Mrabet et al., 2008; Al Jasser, 2009). It is an important member of the family Palmaceae, providing a food for people in the arid and semiarid regions of the world (Saafi et al., 2008). Sawaya et al., (1983) reported that the moisture, total nitrogen, fat, fiber, ash, tannins, vitamin C, β-carotene and ten nutritionally important minerals of the date were highest in the early stages of development and decreased during maturation. Date fruits have phenolic compounds possessing antioxidant activity (Mansouri et al., 2005). The aim of this study was to determine the antioxidant activity, total phenol, nutritional value, mineral contents, and fatty acid composition of ripe date fruits purchased from local markets.

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MATERIAL AND METHODS

Processed date palm fruits of three varieties (Khalas, Sugei and Sukary) were purchased from local markets. About 100 g of the sample was taken, stoned and the average pulp and seed weights were determined. A portion of the seed mixture was ground by a hammer mill and the moisture content was determined. The date part was dried at about 50 ^{o}C, and kept at +4 ^{o}C until analyses.

The moisture content of pulp and pits were established separately by drying a sample (about 5 g) in a drying oven at 100 ±5 ^{o}C during 24 h. Crude fat, crude fiber, crude ash, colour values of samples were determined according to the Association of Official Analytical Chemists (AOAC, 2003). Energy value was measured by IKA C2000 calorimeter (Sundy, China). Protein content was determined by the Dumas Nitrogen Analyzer (DNA) (Velp NDA 701- Monza, Brianza-Italy). Protein was calculated using the general factor (6.25).

Working conditions of DNA were the following:

O_2 flow rate: 400 ml/min; He flow rate: 195 ml/min; Combustion reactor 1030 ^{o}C; Reduction reactor: 650 ^{o}C; Pressure: 881.0 mbar

Total phenolic contents of date fruits were estimated using Folin Ciocalteu (FC) reagent as described by Yoo et al. (2004) with some modifications.

The free radical scavenging activity of the extracts was determined by using 1,1-diphenyl-2-picrylhydrazyl or DPPH (Lee et al., 1998).

Sugars were extracted from 1 g of broyat by a 100 ml water solution. Surnagent was filtered by 0.45 micron filter, and was analysed by HPLC, using a chromatograph of the type Agilent 1100 . The mobile phase was distilled water. The separation was carried out on a Bio-RAD HPLC Carbohydrate Analysis Column Aminex HPX-87C Carbohydrate Column (300 mm X 7,8 mm). The flow rate was 0.60 ml/min. Sugar quantifications were made by comparison to the standards glucose, fructose and sucrose (Merck).

Results were analysed for statistical significance by analysis of variance (Püskülcü and İkiz, 1989).

RESULTS AND DISCUSSION

Carcass The average compositions of the three varieties' fruits and seeds are presented in Table 1. Moisture levels of date pulp and seeds ranged between 13.43% (Khalas) and 16.17% (Sugei) and from 4.7% to 5.96%, respectively. Crude oil of seed ranges between 4.35% (Sugei) and 4.51% (Khalas). Crude ash contents of date pulps varied between 1.96% (Sukary) and 2.06% (Khalas) (Table 1). The crude protein contents of dafe fruit were found between 1.43% (Sugei) and 2.55 % (Sukary), fiber contents of pulp were determined between 2.45% and 2.49%. Saafi et al., (2008) reported that date pulp contained 39.25% moisture, 63.38 % total sugars, 51.56% reducing sugars, 11.82% sucrose, 3.86% protein and 0.26 % fat.

Energy values of date pulp ranged between 3661 Kcal/kg and 3791 Kcal/kg, energy values of date seeds changed between 4560 Kcal/kg and 4669 Kcal/kg (Table 1). The total phenolics content of date pulp ranged between 3.599

mg GAE/1 00 ml (Khalas) and 7.306 mg GAE/100 ml (Sukary). In addition, the total antioxidant activity was found between 76.847 µg/ml (Khalas) and 79.035 µg/ml (Sugei) (Table 1).

Table 1: Physical and chemical properties of processed date pulp and seeds

Constituents	***Khalas***		***Sugei***		***Sukary***	
	Pulp	**seed**	**Pulp**	**seed**	**Pulp**	**seed**
Moisture (%)	13.43* ± 0.27**	5.00 ± 0.17 c****	16.17 ± 102a	4.70 ± 0.21c	15.29 ± 0.67a	5.96 ± 0.32c
Weigths (g/fruit)	10.06 ± 2.3b	0.95 ± 0.09d	15.37 ± 1.67a	0.98 ± 0.07d	11.94 ± 1.42b	1.22 ± 0.13c
Crude oil (%)	0.35 ± 0.02b	4.51 ± 0.64a	0.32 ± 0.03b	4.35 ± 0.24a	0.38 ± 0.02b	4.41 ± 0.32a
Crude ash (%)	2.06 ± 0.11a	0.98 ± 0.03b	2.05 ± 0.24a	0.87 ± 0.06b	1.96 ± 0.17ab	0.92 ± 0.04b
Crude fiber (%)	2.49 ± 0.15b	19.07 ± 1.12a	2.48 ± 0.13bc	19.21 ± 1.23a	2.45 ± 0.17b	20.13 ± 1.67a
Crude protein %)	1.45 ± 0.09c	4.87 ± 0.14a	1.43 ± 0.07c	5.13 ± 0.21a	2.55 ± 0.13b	5.24 ± 0.17a
Sucrose (%)	0.59c	-***	1.13b	-	57.17a	-
Glucose (%)	52.59a	-	52.21a	-	23.32b	-
Fructose (%)	46.82a	-	46.65a	-	19.51b	-
Polarity	-18.52b	-	-18.28b	-	39.34a	-
Energy Kcal/Kg)	3676c	4590b	3661c	4560b	3791c	4669a
Antioxidant activity (µg/ml)	79.035a	-	76.848b	-	76.847b	-
Total phenol (mg GAE/100 ml)	5.564b	-	7.306a	-	3.599c	-

* mean

**standard deviation

***undetermined

****Within each line, values followed by differennt letters are significantly at 5% level.

Table 2. Color values of processed date pulp

Color parameters	***Khalas***	***Sugei***	***Sukary***
L	49.93±0.13b	50.29±1.23a	50.69±0.67a
a	12.61a	12.12b	12.13b
b	13.19±0.17a	12.54±0.18b	12.50±0.27b

****Within each line, values followed by differennt letters are significantly at 5% level.

The total phenolics content reported by Al-Farsi et al., (2005) for several date varieties ranged between 217 and 343 mg per 100 g. In our study, sucrose and reducing sugar contents of date pulp were determined to be 57.17% and 42.83% for Sukary, 0.59% and 99.41% for Khalas and 1.13% and 98.86% for sugei, respectively (Table 1). Date pits from the "Khalti" variety contained

6.88% of moisture, 8.12% of total sugar, 6.63% reducing sugar, 1.49% of sucrose, 5.31% of protein and 8.33% of fat (Saafi et al., 2008).

Color values of date pulps are presented in Table 2. 'L' values ranged from 49.93 (Khalas) to 50.69 (Sukary), while 'a' values varied between 12.12 (Sugei) and 12.61 (Khalas). In addition, 'b' values of pulps were found to be between 12.50 (Sukary) and 13.19 (Khalas) (Table 2).

The fatty acid composition of date pulp are given in Table 3. The most abundant fatty acids of the date pulp oil were oleic, linoleic, palmitic, linolenic and stearic acids. The date pulp oils contain between 15.86% (Sugei) and 24.16% (Khalas) palmitic acid, between 5.99% (Sugei) and 9.3% (Khalas) stearic acid, between 23.88% (Sukary) and 27.31% (Sugei) oleic acid, between 30.1% (Khalas) and 35.99% (Sugei) linoleic acid, between 10.7% (Khalas) to 14.8% (Sugei) linolenic acid. The total fatty acid contents of date pulps ranged between 95.26 % (Sukary) to 99.98 % (Sugei). Saafi et al., (2008) reported that the date pulp oil contained 67.51 % unsaturated fatty acid represented by linoleic acid (32.77%), oleic acid (23.35%) and linolenic acid (9.19%).

Date fruits undergo many physical and chemical changes during maturation. Some of these changes, such as the decrease in the concentration of tannins, ascorbic acid and β-carotene directly affect their antioxidant capacity (Alaith, 2008). Those differences according to our studies may be attributed to the variability of the studied cultivars and also to the variability of the climatic conditions, different regions, the differences in time of harvest, post-harvest treatments, and the use of fertilizers. Generally, date palm varieties are a potential source of valuable nutrients. The analyses of the date pulp from these common varieties suggested that it could be used in food industries as an important and inexpensive source of sugars, especiall reducing sugars, which have nutritional and technological values (Saafi et al., 2008).

Table 3. Fatty acid compositions of processed date pulp oil (%)

Fatty acids	***Khalas***	***Sugei***	***Sukary***
Palmitic	24.16±0.27a*	15.84±0.11c	20.1±0.6b
Stearic	9.3±0.4a	5.99±0.15ca	7.1±0.3b
Oleic	25.64±1.12b	27.31±0.21a	23.88±1.17c
Linoleic	30.1±1.18b	35.99±0.17a	33.18±1.23ab
Linolenic	10.7±0.8b	14.85±0.13a	11.00±0.48b
Total	99.90±1.31	99.98±1.28	99.26±1.89

*Within each line, values followed by differennt letters are significantly at 5% level

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