



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(2): 697-699
Received: 21-01-2018
Accepted: 22-02-2018

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Dietary fiber and minearl composition of date palm (*Phoenix dactylifera* L.) Seeds

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Abstract

The seeds of four date palm (*Phoenix dactylifera* L.) cultivars, *Hillawi*, *Khadrawi*, *Shamran* and *Medjool* were analyzed for their dietary fiber and mineral composition. Total dietary fiber (72.27g/100g) and insoluble dietary fiber (63.44g/100g) were highest in seed of variety *Hillawi*. All the four varieties of date seed differed non-significantly from each other for their total dietary fiber, soluble dietary fiber and insoluble dietary fiber content. The variety *Medjool* contained highest amount of phosphorus (121.33mg/100g) and iron (1.83mg/100g) while variety *Hillawi* contained highest amount of zinc (1.49mg/100g). A non-significant ($p < 0.05$) difference was observed in calcium, potassium and magnesium content of all the varieties. Polyphenol content of date seed from different varieties ranged from 3065 to 2731.67 mg GAE/100g being highest in variety *Shamran* and lowest in variety *Medjool*.

Keywords: Dietary fiber, minearl composition, *Phoenix dactylifera* L.

1. Introduction

They are very rich source of dietary fiber (73.1g/100g) and phenolics (3942mg/100g). The use of date seed in fiber-based foods and dietary supplements are suggested due to the excellent content of dietary fiber in the seed (Al-Farsi and Lee, 2008) [2]. The high content of the insoluble fiber induces satiety, and has a laxative effect due to increased stool weight. Date seeds are a very rich source of dietary fiber; the level varied between 64.5 and 80.15 g/100 g fresh weight. Insoluble dietary fiber (hemicellulose, cellulose, and lignin) is considered to be the major constituent of seed fiber (Al-Farsi & Lee, 2008) [2]. Dietary fiber has important therapeutic implications for certain conditions, such as diabetes, hyperlipidemia, and obesity, and may have a protective effect against hypertension, coronary heart disease, high cholesterol, colorectal and prostate cancers, and intestinal disorders (Tariq *et al.*, 2000) [14]. Date seed is composed of several important minerals, namely potassium, magnesium, calcium, phosphorus, sodium and iron (Hamada *et al.*, 2002; Ali-Mohamed and Khamis, 2004; Besbes *et al.*, 2004a; Al-Farsi *et al.*, 2007; Habib and Ibrahim, 2009; Nehdi *et al.*, 2010) [9, 3, 6, 8, 4]. The total mineral content that was found in date seed was comparable with the mineral content in barley, shows that the date seed can be as a good source of minerals, and can also be used to substitute the usage of barley in food products for the same purpose (Ali-Mohamed and Khamis, 2004) [4].

Since the dietary fiber (5.9-8.7 g/100 g) and phenolic (172-246 mg gallic acid equivalent/100 g) contents in date flesh are much lower than in date seeds, date seeds could potentially be utilized as a functional food ingredient (Al-Farsi *et al.*, 2007) [3]. Phenolic compounds of fruit seeds, such as phenolic acids and flavonoids, have been shown to possess many beneficial effects, including antioxidant, anti-carcinogenic, antimicrobial, antimutagenic, and anti-inflammatory activities, and the reduction of cardiovascular disease (Shahidi and Naczsk, 2004) [12]. Thus, it is important to increase the antioxidant intake in the human diet, and one way of achieving this is by enriching food with natural phenolics. The phenolic acids detected in date seed were gallic acid, protocatechuic acid, p-hydroxybenzoic acid, vanillic acid, caffeic acid, p-coumaric acid, ferulic acid, m-coumaric acid and o-coumaric acid (Al-Farsi and Lee, 2008) [2]. Utilization of such waste is very important as date seeds could potentially be considered as an inexpensive source of dietary fiber and natural antioxidants. The good nutritional value of date seeds is based on their dietary fiber content, which makes them suitable for preparation of fiber based foods and dietary supplements.

2. Material and method

2.1 Materials

Four varieties of date fruit, namely *Hillawi*, *Khadrawi*, *Medjool* and *Shamran* were procured in a single lot from the Department of Horticulture, College of Agriculture, CCS Haryana

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Agricultural University, Hisar. All the varieties were cleaned and washed under tap water to remove dirt and dust. The washed dates were spread over filter paper to remove excess water. Seeds were collected after deseeding of date fruit and dried in hot air oven at $60\pm 5^{\circ}\text{C}$ till constant weight. The dried date seeds were ground to fine powder in an electric grinder and kept in air tight containers at room temperature for analysis of various nutrients.

2.2 Methods

The total dietary fiber, soluble dietary fiber and insoluble dietary fiber were estimated by enzymatic method (Furda, 1981). Total minerals determined by using an Atomic Absorption Spectrophotometer according to the method of Lindsey and Norwell (1969) [10]. Polyphenols were extracted by the method of Singh and Jambunathan (1981) [13].

3. Results and Discussion

3.1 Dietary fiber

It is evident from Table 1 that there were non-significant differences in total, soluble and insoluble dietary fiber content of seeds from different varieties of date fruit. The range of total, soluble and insoluble dietary fiber was 66.46 to 72.27%, 8.82 to 9.57% and 57.63 to 63.44%, respectively. All the seeds from different varieties contain more insoluble dietary fiber as compared to soluble dietary fiber as shown in fig.1. Besbes *et al.*, 2004a [6] (on a dry-weight basis) obtained total

carbohydrate as 83.1 and 81.0%, respectively for *Deglet Nour* and *Allig* cultivars. Al-Farsi *et al.*, 2007 [3] reported a higher content of total dietary fiber in three seed varieties ranging between 77.8 and 80.2%.

Table 1: Dietary fiber content of different varieties of seeds of date fruits (% , on dry weight basis)

Variety	Dietary fiber		
	Total dietary fiber	Soluble dietary fiber	Insoluble dietary fiber
Hillawi	72.27 \pm 2.12	8.82 \pm 0.14	63.44 \pm 2.25
Khadrawi	69.59 \pm 1.50	9.57 \pm 0.47	60.03 \pm 1.09
Medjool	66.46 \pm 2.13	8.83 \pm 0.17	57.63 \pm 2.12
Shamran	71.07 \pm 4.28	9.40 \pm 0.39	61.67 \pm 4.39
CD (P \leq 0.05)	NS	NS	NS

Values are mean \pm SE of three independent determinations

In comparison, higher dietary fiber was detected in another study that was carried out on three different date varieties, which range from 65% to 69% of date seed, indicate the high content of lignin and resistant starch (Hamada *et al.*, 2002) [9]. These differences could be related to stage of maturation and varieties differences. The total dietary fiber found in date seed was 58%, with 53% of it was insoluble dietary fiber namely as hemicelluloses, cellulose and lignin (Alhdaheri *et al.*, 2004; Al-Farsi and Lee, 2008) [2].

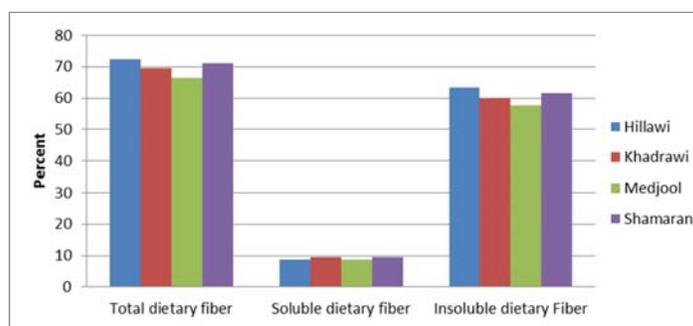


Fig 1: Dietary fiber of seeds of different varieties of date fruit (% , dry weight basis)

3.2 Minerals

It was found that calcium content of seeds from the different varieties of date fruits varied from 23 to 28 mg/100g with non-significant differences (Table 2). Similarly, a narrow

range with respect to potassium (170.66 to 182.33 mg/100g) and magnesium content (28.00 to 35.33 mg/100g) of the seeds were observed.

Table 2: Mineral content of seeds of different varieties date fruits (mg/100g, on dry weight basis)

Variety	Minerals					
	Calcium	Phosphorus	Iron	Zinc	Potassium	Magnesium
Hillawi	24.00 \pm 3.46	112.67 \pm 1.76	1.29 \pm 0.03	1.49 \pm 0.02	182.33 \pm 1.45	35.00 \pm 2.08
Khadrawi	28.00 \pm 2.08	114.00 \pm 2.08	1.43 \pm 0.07	1.11 \pm 0.04	177.33 \pm 2.91	32.33 \pm 1.45
Medjool	23.00 \pm 2.30	121.33 \pm 1.76	1.83 \pm 0.03	1.46 \pm 0.04	181.33 \pm 4.98	28.00 \pm 1.73
Shamran	26.00 \pm 2.64	121.00 \pm 1.15	1.72 \pm 0.04	1.32 \pm 0.07	170.66 \pm 2.97	35.33 \pm 2.33
CD (P \leq 0.05)	NS	5.71	0.15	0.15	NS	NS

Values are mean \pm SE of three independent determinations

Further, it was found that phosphorus content of seed from varieties *Hillawi* and *Khadrawi* was similar (112.67 and 114.00 mg/100g, respectively) and that of varieties *Medjool* and *Shamran* (121.33 and 121.00 mg/100g, respectively) was similar. Further, it was indicated that seeds from variety *Medjool* contained the maximum (1.83 mg/100g) amount of iron while seeds from variety *Hillawi* contained the minimum (1.29 mg/100g). The seeds from variety *Medjool* had

significantly (P \leq 0.05) higher amount of iron as compared to seeds from varieties *Hillawi* and *Khadrawi* however, iron content of the seeds from varieties *Medjool* and *Shamran* differed non-significantly. Total zinc content of seeds from all the varieties of date fruits i.e. *Hillawi*, *Khadrawi*, *Medjool* and *Shamran* was 1.49, 1.11, 1.46 and 1.32 mg/100g, respectively. The seeds from varieties *Hillawi* and *Medjool* contained almost similar amount of zinc, whereas a significant

difference was observed in zinc content of the seeds from varieties *Khadrawi* (1.11 mg/100g) and *Shamran* (1.32 mg/100g). These results were in general agreement with those reported by Habib and Ibrahim, 2009^[8] but lower than those reported by Besbes *et al.*, 2004a^[6] and Ali- Mohamed and Khamis, 2004^[4]. These differences may be attributed to the variability of the studied cultivars.

3.3 Polyphenols

Polyphenol content of seeds from different varieties of date fruit ranged from 3065 to 2731.67 mg GAE/100g being highest in variety *Shamran* and lowest in variety *Medjool*. There were non-significant difference in polyphenol content of seeds from varieties *Hillawi*, *Khadrawi* and *Shamran*. Al-Farsi *et al.*, 2007^[3] reported high levels of phenolics (3102–4430 mg GAE/100g) in date seed. In another study, 2015 mg GAE/100g of phenolic content have been directly extracted from the seed of a variety of date fruit (Amany *et al.*, 2012)^[5].

4. Conclusion

Date seeds are the good source of dietary fiber specially insoluble dietary fiber. Date seeds also contain fair amount of minerals and high amount of polyphenols. In addition, the other nutritional value of date seeds is based on their dietary fiber content, which makes them suitable for the preparation of fiber-based foods and dietary supplements.

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