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

Vinita and Darshan Punia

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 (72.27 g/100g) and insoluble dietary fiber (63.44 g/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 (121.33 mg/100g) and iron (1.83 mg/100g) while variety Hillawi contained highest amount of zinc (1.49 mg/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, mineral composition, *Phoenix dactylifera* L

1. Introduction

They are very rich source of dietary fiber (73.1 g/100g) and phenolics (3942 mg/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/100g) 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 Naczk, 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...
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±5°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 date fruits (% on dry weight basis)

<table>
<thead>
<tr>
<th>Variety</th>
<th>Total dietary fiber</th>
<th>Soluble dietary fiber</th>
<th>Insoluble dietary fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillawi</td>
<td>72.27±2.12</td>
<td>8.82±0.14</td>
<td>63.44±2.25</td>
</tr>
<tr>
<td>Khadrawi</td>
<td>69.59±1.50</td>
<td>9.57±0.47</td>
<td>60.03±1.09</td>
</tr>
<tr>
<td>Medjool</td>
<td>66.46±2.13</td>
<td>8.83±0.17</td>
<td>57.63±2.12</td>
</tr>
<tr>
<td>Shamran</td>
<td>71.07±4.28</td>
<td>9.40±0.39</td>
<td>61.67±4.39</td>
</tr>
<tr>
<td>CD (P≤0.05)</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

Values are mean ± 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].

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)

<table>
<thead>
<tr>
<th>Variety</th>
<th>Calcium</th>
<th>Phosphorus</th>
<th>Iron</th>
<th>Zinc</th>
<th>Potassium</th>
<th>Magnesium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillawi</td>
<td>24.00±3.46</td>
<td>112.67±1.76</td>
<td>1.29±0.03</td>
<td>1.49±0.02</td>
<td>182.33±1.45</td>
<td>35.00±2.08</td>
</tr>
<tr>
<td>Khadrawi</td>
<td>28.00±2.08</td>
<td>114.00±2.08</td>
<td>1.43±0.07</td>
<td>1.11±0.04</td>
<td>177.33±2.91</td>
<td>32.33±1.45</td>
</tr>
<tr>
<td>Medjool</td>
<td>23.00±2.30</td>
<td>121.33±1.76</td>
<td>1.83±0.03</td>
<td>1.46±0.04</td>
<td>181.33±4.98</td>
<td>28.00±1.73</td>
</tr>
<tr>
<td>Shamran</td>
<td>26.00±2.64</td>
<td>121.00±1.15</td>
<td>1.72±0.04</td>
<td>1.32±0.07</td>
<td>170.66±2.97</td>
<td>35.33±2.33</td>
</tr>
<tr>
<td>CD (P≤0.05)</td>
<td>NS</td>
<td>5.71</td>
<td>0.15</td>
<td>0.15</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

Values are mean ± 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≤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.

5. References