



## Antioxidant Activity of Date Seed Oils of Fifteen Varieties from Iran

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### ABSTRACT

In this research, extraction and antioxidant activities of the oils from 15 varieties of Iranian date seeds were investigated. Khazravi variety (13.2%) and Kaliteh variety (6.2%) had highest and lowest yields of seeds with the average of 9.5% respectively. The highest and the lowest yields of oils were related to the Shavi-shirin variety (13.2%) and Piarom variety (6.4%) with the average of 9.5% respectively. Antioxidant activities of the oils were determined with DPPH radical scavenging assays. Results showed that Shavi-talkh and Estamaran varieties had highest and lowest activities with amount of 55.5% and 5.1% respectively (with average 30.1%). It was found that the some oils significantly reduced the concentration of DPPH free radical, with an efficacy higher than that of trolox (34.0%). These results may be encouraged interest in date seed oils for use in cosmetics, pharmaceuticals and food industries.

**Key Words:** Date, *Phoenix dactylifera*, Date seed oil, Antioxidant activity.

### INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is a principal fruit that is grown in many regions of the world and considered as an important traditional crop in Iran and Islamic countries<sup>1</sup>. It has also played an important role in the social life of the people of arid and semiarid regions<sup>2</sup>. About 1,023,130 metric tons of dates were produced in Iran during 2010<sup>3</sup>.

The fruit of the date palm is composed of a fleshy pericarp and the seed. Date seeds constitute approximately 10% of the fruit (1, 4). Other studies indicate some potential uses for the date seed and

its constituents in chemical, cosmetics, pharmaceuticals, feed and food industries<sup>1,2,4-7</sup>. In some countries such as Iran, the wastage of date seeds is a problem in agricultural and industrial processing in which they discarded or utilized on a small scale as animal feed<sup>1,2</sup>. So, finding a way to make a profit on the pits would benefit date farmers substantially.

Some reports were appeared in literature about fatty acid composition of date seed oil in other countries<sup>2, 8-17</sup>. Despite the application of the oil in the industries, few investigates has been carried out on the extraction of oil from date seeds cultivated in Iran<sup>1, 18</sup>. So, the objective of this study is

antioxidant activities of date seed oils cultivated in different provinces of Iran.

## MATERIAL AND METHODS

### Samples Collection and Preparation

Fifteen varieties of date cultivated in Iran (Khuzestan, Hormozgan, Bushehr, Fars and Kerman provinces) were collected. The geographical characteristics are given in Table 1. Then, the seeds were totally isolated, washed and air-dried. The percentage yields of seeds were obtained by dividing the weight of seeds on the weight of the fresh fruits multiplied by 100 (Fig. 1).

### Oil Extraction

The extraction of the oils involved 5 steps: choosing suitable solvent and solid/liquid ratios, re-milling of seed powder between Reflux and Soxhlet systems, effects of time, method of extraction and date seeds size. In all experiments, the seeds (Zahedi variety) were weight and dried for 1h in 50 °C oven. After that, using the hammer mill and 1-3mm screens, the seeds were milled and poured in balloons. Then, the solvents including n-hexane, petroleum ether, CCl<sub>4</sub>, chloroform and diethyl ether with the ratios of 1/2 and 1/15 were added. Next, the Reflux and Soxhlet systems were used consecutively for 0.5-3h. In one step, the seed powders were remilled between Reflux and Soxhlet systems. Subsequently, the samples were strained and removed the solvent by rotary evaporator. The given oils were finally weighted. The oil yields were calculated by following formula: seed weight/date weight × 100.

### Antioxidant Activity of the Oils

The hydrogen atom or electron donation abilities of the oils were measured from the bleaching of the purple-colored n-hexane solution of 2,2-diphenylpicrylhydrazyl (DPPH). This spectrophotometric assay uses the stable radical DPPH as a reagent 30. In order to find out the effective dose of oil, different concentrations (0, 5, 10 and 20% v/v in n-hexane) were added to DPPH reaction mixture and the concentration-dependent inhibition in DPPH radical scavenging capacity was recorded (Data not shown). Based on this, further experiments were carried out with 20% (V/V) of the oil. Then, fifty µl of the oils in n-hexane were added

to 5 ml of DPPH solution (0.004% DPPH in n-hexane). Trolox (1.00 mM, 0.500 mM and 0.250 mM), a stable antioxidant, was used as reference. After incubation for 30 min at room temperature, the absorbance was read against the blank at 517 nm. The following formula was used to estimate the inhibitory effects of the oil extract in percent (I%): I% = (A blank – A sample/A blank) × 100. Where, A blank is the absorbance of the control reagent (containing all reagents except the test compound), and A sample is the absorbance of the test compound. All the assays were carried out in triplicate.

## RESULTS AND DISCUSSION

### Seeds and Seed Oils Yields

The yield of seeds is shown in Figure 1. The highest yield is related to the Khazravi variety (13.2%) and the lowest one is related to Kliteh variety (6.2%) with the average of 9.5%. Also, the yields of oil extracted from 15 date varieties, are presented in Fig. 2. The used conditions included petroleum ether solvent, ratio of the milled seed to solvent (1/3), re-milling, using 1.5h Reflux and 1.5h Soxhlet and the seed size of 1mm. The highest yield is related to the Shavi-shirin variety (13.2%) and the lowest one is related to Piarom variety (6.4%) with the average of 9.5%.

Previous study on three varieties of the Iranian palm including Deiri, Khazravi and Samaran, indicated the oil yields as 9.32, 8.54 and 10.84 respectively<sup>1</sup>. In another study on 14 varieties, the oil yields were given 5-9% (14). The oil yields of Tunisian palm seed, were presented 10.19 and 12.67 for Dajlate Noor and Alig varieties, respectively<sup>2</sup>. In another study on Emirate palm (Fard, Khalas and Lolo), the oil yields were 9.9, 13.2 and 10.5, respectively<sup>3</sup>.

### Antioxidant activities of the oils

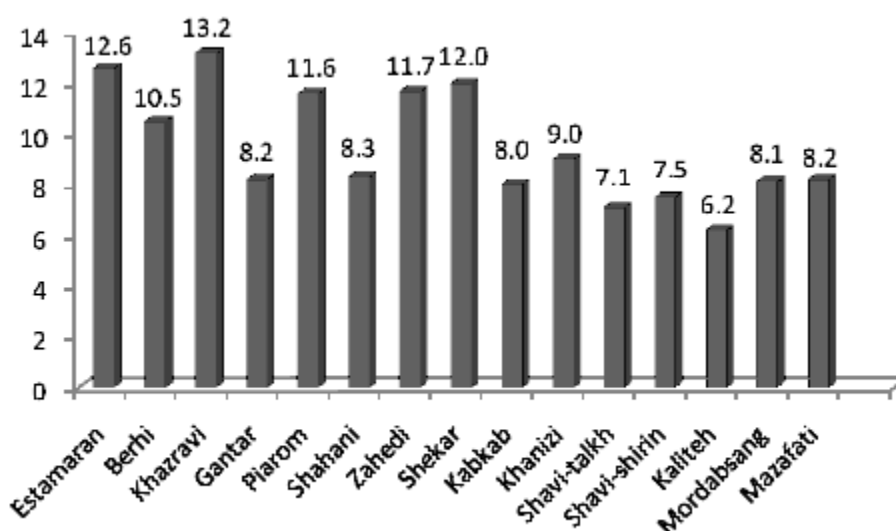
The antioxidant properties of the oils measured by DPPH assay, are presented in Figure 1. Shavi-talkh and Estamaran varieties had highest and lowest activities with amount of 55.5% and 5.1% respectively (with average 30.1%). When compared to a standard antioxidant agent, i.e. trolox, it was found that the some oils significantly reduced the concentration of DPPH free radical, with an efficacy

**Table 1: Dates Characteristics of Collected Region, Province and Collected Season**

	Date	Collected Region	Province	Collected Season
1	Estamaran	Shadegan	Khuzestan	September
2	Berhi	Abadan	Khuzestan	September
3	Khazravi	Ahvaz	Khuzestan	October
4	Gantar	Abadan	Khuzestan	November
5	Piarom	Hajiabad	Hormozgan	October
6	Shahani	Jiroft	Bushehr	October
7	Zahedi	Bushehr	Bushehr	November
8	Shekar	Bushehr	Bushehr	September
9	Kabkab	Dashtestan	Bushehr	November
10	Khanizi	Jahrom	Fars	October
11	Shavi-talkh	Jahrom	Fars	September
12	Shavi-shirin	Jahrom	Fars	September
13	Kaliteh	Jiroft	Kerman	October
14	Mordabsang	Jiroft	Kerman	October
15	Mazafati	Bam	Kerman	October

higher than that of trolox (34.0%). The antioxidant activity of the oils from varieties of date seeds may be attributed to different components. This activity may have been partly contributed by some constituents other than fatty acids e.g. tocopherols and phenolic compounds<sup>19</sup>. This research may encourage interest in date seed oils for use in cosmetics, pharmaceuticals and food industries.

In other research, the antioxidant activity and total phenolic compounds of 14 different varieties of date palm seed extracts with 5 solvents (water, methanol, methanol (50%), DMSO, and water: methanol: acetone: formic acid (20:40:40:0.1)) were evaluated<sup>20</sup>. Ferric reducing antioxidant power assay and Folin-Ciocalteu reagent have been used for determination of the

**Fig. 1: Yields of Seeds Obtained from of 15 Varieties Dates**

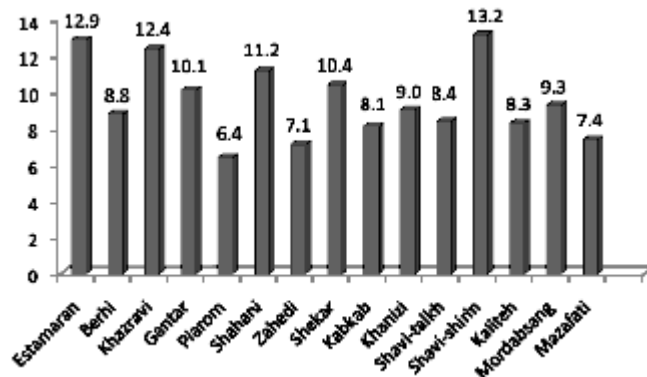


Fig. 2: Yields of Extracted Oils from of 15 Varieties Date Seeds

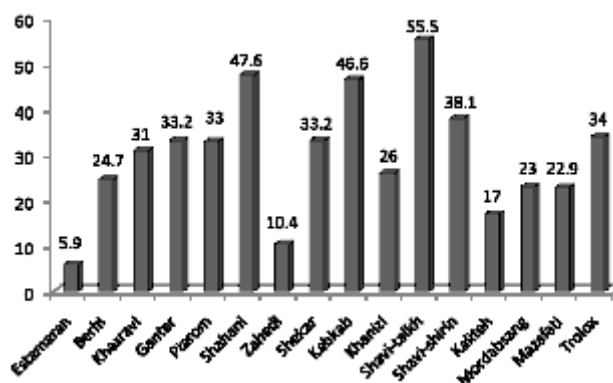


Fig. 3: Antioxidant Activities of 15 Varieties Date Seed oils versus Standard (Trolox)

antioxidant effect and phenolic content of date seeds. DMSO extract of the “Zahedi” variety had the highest antioxidant effect (37.42 mmol/100 g dry plant) and total phenolic content (3541 mg /100 g dry plant) among these 14 varieties and 5 solvents.

In recent study, the antioxidant activities of seeds from seven date samples of Saudi Arabia were evaluated by total phenol method<sup>21</sup>. The antioxidant activity of seeds obtained from different date fruits changed between 78.03 (mg/ml) (Monaif cv) and 79.94 (mg/ml) (Barhi cv). In addition, the total phenol contents of seeds were found between 1.98 mg gallic acid equivalents (GAE)/100 g (Barhi cv) and 4.65 mg GAE/100 g (Soughi cv).

### CONCLUSION

The seeds oil yields from 15 varieties of

Iranian date were from 6.2 to 13.2% with the average value of 9.5%. In this situation, the highest oil yield is related to the Shavi-shirin variety (13.2%) and the lowest one is related to the Piarom variety (6.4%). Shavi-talkh and Estamaran varieties had highest and lowest antioxidant activities with amount of 55.5% and 5.1% respectively with the average 30.1%. It was found that the some oils significantly reduced the concentration of DPPH free radical, with an efficacy higher than that of trolox (34.0%). These results may be encouraged interest in date seed oils for use in cosmetics, pharmaceuticals and food industries.

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