



COMPARISON OF PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF TWO DIFFERENT VARIETIES OF UNRIPE DATE PALM

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ABSTRACT :

Date palm is a multipurpose tree providing carbohydrate, fiber, vitamin and mineral besides having certain medicinal properties. Due to its high nutritional value and the long life the date palm has been mentioned as "tree of life". The present study investigates the nutritional and functional properties of two different varieties of unripe date palm namely khenazi (red colour date palm) and barhi (yellow colour date palm) were collected from Dharamapuri district of Tamil Nadu, India. The collected sample was made into powder using cabinet drier and pulverizer then subjected for analysis. The nutritional and functional parameters were studied under standard analytical procedure using AOAC methods. The results revealed that khenazi date palm variety was found to be high in carbohydrate, protein and fiber content whereas the fat content is lower than that of the other date palm variety such as barhi. However, potassium content was high and sodium content was low in both varieties. Thus, it may be beneficial for people suffering from hypertension. In addition calcium, iron and phosphorous was also high in khenazi than barhi. From the obtained results of two different date varieties khenazi can serve as good source of vital nutrients and minerals than that of barhi.



KEYWORDS : fiber, vitamin and mineral besides, nutritional and functional parameters.

1. INTRODUCTION

Date palm (*Phoenix dactylifera*) is among the oldest plant cultivated on earth and widely planted in hot and dry climate of Asia, Middle East Africa and Arabian Peninsula. It is an important food resource of the people in these regions and plays an important role in their day to day lives (Al-Farsi, 2005). The date fruit is composed of a seed and fleshy pericarp which constitutes between 85% and 90% of date fruit weight (Husein, 1998). Dates are a good source of energy, vitamins and a group of elements like phosphorous, iron, potassium and a significant amount of calcium. Besides nutritional value date fruit are rich in phenolic components which possess antioxidant activity. The chemical compositions of dates vary depending on cultivator, soil condition and agronomics practices as well as ripening stage (Ahmed, 2006). The objective of this research is to compare the existing difference in the physical and functional properties between two different varieties of dates which are grown in our state Tamil Nadu, India. There is less information about dates which are grown in our country. The detailed information of this study will enhance the utilization of dates by the people in and around to improve their nutritional status.

2. MATERIALS AND METHODS

2.1 COLLECTION OF SAMPLE

The fruits are collected from Shalia date palm, Dharmapuri district of Tamil Nadu, India, where they cultivate two different varieties of dates such as **Barhi** and **Khenaizi**. The sample was collected in the month of June and July 2018. The collected dates were checked that free of physical damage and injury from insects and fungal infection and used for all analysis.

2.2 EVALUATION OF PHYSICAL CHARACTERISTIC OF DATE FRUIT

Ten dates from each variety were randomly selected and individually weighed using an analytical balance. The date pit was removed manually and it was re weighed again. The weight of pit was also recorded. The average weight of date fruit, fruit pulp, date pit, fruit length, and fruit diameter were calculated (Harthi, 2015).

2.3 PREPARATION OF SAMPLE

The collected unripe date palm was thoroughly washed with distilled water and then the fruit were cut, deseeded and the pulp portion was dried using cabinet drier at 65°C. These were then ground into uniform powder and stored in air tight container until the commencement of the analysis.

2.4 EVALUATION OF FUNCTIONAL PROPERTIES OF DATE PALM POWDER

The functional properties such as bulk density, pH, water and oil absorption capacity, foam capacity and stability, gelatinization temperature, emulsification capacity and wettability were noticed in two different varieties of date palm powder by using the standard analytical procedures (AOAC method, 2006).

2.5 EVALUATION OF PROXIMATE COMPOSITION OF DATE PALM POWDER

The proximate analysis was done on the dried dates powder. The parameters were analyzed such as moisture content, ash content, total solids, carbohydrate, protein, fat and fiber using AOAC method (2006), beta carotene by DGHS method and minerals by calorimetric method.

2.6 STATISTICAL ANALYSIS

All the experiments were performed in triplicates and the result were presented in mean value \pm standard deviation.

3. RESULT AND DISCUSSION

3.1 PHYSICAL PROPERTIES

The physical properties such as fruit length, diameter, total weight of fruit and pulp and weight of seed were seen.

TABLE I
THE PHYSICAL PROPERTIES OF DATE PALM FRUIT

Variety	Total fruit weight (g)	Fruit pulp (g)	Fruit seed (g)	Fruit length (cm)	Fruit diameter (cm)	Colour	Maturity
Khenaizi	13.73 \pm 1.96	12.75 \pm 1.81	0.87 \pm 0.26	3.73 \pm 0.28	8.08 \pm 0.24	Red	June
Barhi	9.09 \pm 0.21	8.11 \pm 0.38	0.93 \pm 0.07	3.37 \pm 0.23	7.41 \pm 0.27	yellow	July

The values are means of triplicates \pm standard deviation

The physical properties of two different date varieties are presented in table I. The total weight of the dates, khenaizi (13.73±1.96g) and barhi (9.09±0.21g) for 10 number of fruits. Weight is a characteristic used by the farmers to evaluate the quality of varieties and is also influenced by climatic conditions and other cultural practices (Bouhlali et al., 2015). Likewise the fruit pulp also high in **Khanithe** as 12.75±1.81 and low in **Barhias** (8.11±0.38) respectively. Ripening of date fruit occur through four stages namely, kimri, khalal, rutab and tamar. During kimri stage date fruit size and weight increases rapidly (Reuveni, 1986). Collection of matured date from tree is also done at kimri stage where the date colour changes from green to red or yellow depending upon the variety.

The fruit length and diameter of the varieties were also seen higher in **Khanithe** and lower in **Barhi** (3.73±0.28cm and 3.37±0.23 cm) respectively. The shape of the date gives the length and diameter. Barhi fruit is broadly ovate to round and khenaizi is oblong oval (Ghnimi et al., 2017). The weight of the date palm seed was high in barhi and low in khenaizi (0.87±0.26 and 0.93±0.07g) respectively. Different pollen sources can influence the size and shape of seeds (Nixon, 1934). Date seeds represent about 10-15% of the weight of the fruit depending on the variety (Ghnimi et al., 2017). The changes in size and other properties between varieties are may be due to genetic and growth conditions.

3.2 FUNCTIONAL PROPERTIES OF DATE PALM POWDER

The some of the functional properties of the food materials are very important for the appropriateness of the diet, behavior of nutrients in food during processing, storage and preparation because they affect the general quality of foods as well as their acceptability (Omuetietal, 2009).

TABLE II
THE FUNCTIONAL PROPERTIES OF DRIED UNRIPE DATE PALM POWDER

S.no	Parameter	Varieties	
		Khenaizi	Barhi
1.	Bulk density(g/cm ³)	0.46±0.01	0.49±0.02
2.	Ph	3.64±0.85	5.39±0.76
3.	Water absorption capacity (%)	2.15±0.03	2.09±0.07
4.	Oil absorption capacity (%)	1.23±0.05	1.14±0.08
5.	Foam capacity (%)	5.43±0.41	7.01±1.63
6.	Foam stability (%)	28.33±2.86	32.33±2.05
7.	Gelatinization temperature (°C)	68.3±0.46	72.6±0.94
8.	Wettability (sec)	3.0±0.81	4.6±0.47
9.	Emulsification capacity (%)	31.40±0.68	34.30±1.24

The values are means of triplicates ± standard deviation.

The above table II represents the functional properties of date palm powder. Bulk density was determined using the mass or volume relationship by filling an empty plastic container of predetermined volume and mass with fruits that were poured from a constant height and weight (Owalarafe et al., 2007). The results revealed that the bulk density of **Khenaizi** and **Barhi** are 0.46±0.01 and 0.49±0.02 respectively, which indicate that the particle size was high in barhi compared to khenaizi. Hayetchibane, (2007) reported that dates are slightly acidic and they ranged between 5 and 6. Our data also supported the study that the both varieties were acidic in nature such as 3.64±0.85 of khenaizi and 5.39±0.76 of barhi respectively.

The water absorption capacity was 2.15±0.03 in **Khenaizi** and 2.09±0.07 in **Barhi** indicating its heaviness, suggesting its suitability as a binder and can be used in making any instant product (Zakueta 2009). The oil absorption capacity of both varieties were 1.23±0.05 and 1.14±0.08 in **Khenaizi** and **Barhi** respectively. High oil absorption capacity suggested that this material could be used as an ingredient to stabilize foods with a high percentage of fat and emulsion (Elleuch et al.,). The foam capacity and stability were high in **Barhi** (7.01±1.63 and 32.33±2.05) and low in **Khanithe** (5.43±0.41 and 28.33±2.86). The

gelatinization temperature of khenazi and barhi are 68.3 ± 0.46 °C and 72.6 ± 0.94 °C respectively. These values are very close to the value (72.01 ± 0.60 °C) reported by shaba et al., (2015). Tsakama (2010) stated that wettability was primarily a measure of hydrophilic properties, mainly the ability of the powder particles to be wetted by water. The tendency of powder to form lumps on adding water indicates lack of wettability. The wettability and emulsification capacity of both varieties were (3.0 ± 0.81 and 4.6 ± 0.47) and (31.40 ± 0.68 and 34.30 ± 1.24) respectively. These properties show that the date palm powder has good dissociation power and good emulsifier.

3.3 NUTRITIONAL COMPOSITION OF DATE PALM POWDER

The proximate composition of the dried date palm powder were analyzed and the results shown in table III

TABLE III
THE PROXIMATE COMPOSITION OF DRIED UNRIPE DATE PALM POWDER

S.no	Parameter	Varieties	
		Khenazi	Barhi
1.	Moisture content (%)	2.14 ± 0.05	14.13 ± 1.55
2.	Ash content (%)	1.52 ± 0.34	1.47 ± 0.25
3.	Total solids (%)	97.85 ± 0.04	85.86 ± 1.55
4.	Carbohydrate (g %)	69.03 ± 0.77	78.63 ± 0.86
5.	Protein (g %)	4.29 ± 0.77	3.28 ± 0.92
6.	Fat (g %)	0.64 ± 0.06	0.39 ± 0.1
7.	Fiber (g %)	12.21 ± 0.90	6.63 ± 0.86

The values are means of triplicates \pm standard deviation.

The moisture is a good parameter to identify the food spoilage and acceptability. The above table shows the moisture content of khenazi was low and barhi was high with 2.14 ± 0.05 and 14.13 ± 1.55 percentage respectively. Faqir et al., (2012) reported that the moisture content of different date samples namely dora with 14.81 ± 0.36 and karbaline with 12.3 ± 0.24 percentage, these values are in par with our samples too. The difference in moisture content may be due to the place where they were grown, time of harvest and environmental conditions. The low moisture content of sample is not easy to decay (Fennema, 1976). The ash content is an index to evaluate and grade the nutritive value of food. The ash content of the sample khenazi and barhi was 1.52 ± 0.34 and 1.47 ± 0.25 respectively. Low ash content in dates indicates that the total inorganic mineral is low (Oloyede 2005). The total solid content of both varieties of khenazi and barhi were 97.85 ± 0.04 and 85.86 ± 1.55 respectively. The obtained value of barhi is also similar to that of El-Sohaimy, (2010) which was 86.50%.

Date palm is a good source of carbohydrate. Carbohydrate provides the necessary calories in the diet of most people of the world. Carbohydrate is easily digested and promotes the utilization of dietary fats and reduces wastage of protein (Christian, 2006). The carbohydrate content of khenazi was low with 69.03 ± 0.77 g when compared to barhi that has 78.63 ± 0.86 g. The obtained values are in par with the results of Ogungbenle (2011). Borchani, (2010) found that, in 11 Tunisian cultivars of dates the protein content was found to be 2.85g/100g. The sample khenazi has 4.29 ± 0.77 g and barhi as 3.28 ± 0.92 g of protein respectively. The fat content of the sample revealed that 0.64 ± 0.06 g and 0.39 ± 0.1 g in khenazi and barhi respectively. These values are lower than other value obtained by Shaba et al., (2015) for their sample 1.73 ± 0.04 . Fiber decreases the absorption of cholesterol from the stomach in addition to delaying the digestion and conversion of starch to simple sugars an important factor in the management of diabetes (Cust et al., 2009). The obtained result of date fiber was 12.21 ± 0.90 for khenazi and 6.63 ± 0.86 for barhi. Fiber content in food is important for digestion and prevention of cancer.

3.4 VITAMIN AND MINERAL CONTENT OF DATE PALM POWDER

The vitamin and mineral content of date palm powder were noticed.

TABLE IV
THE VITAMIN AND MINERAL CONTENT OF DRIED DATE PALM POWDER

S.no	Parameter	Varieties	
		Khenaizi	Barhi
1.	β Carotene ($\mu\text{g/g}$)	273.22 \pm 5.99	66.74 \pm 0.73
2.	Sodium (mg/100g)	91.03 \pm 1.14	89.58 \pm 0.53
3.	Potassium (mg/100g)	1674.72 \pm 7.0	1457.94 \pm 10.8
4.	Calcium (mg/100g)	41.1 \pm 1.66	36.6 \pm 1.11
5.	Iron (mg/100g)	6.4 \pm 1.32	5.7 \pm 0.65
6.	Phosphorous (mg/100g)	70.60 \pm 1.27	68.53 \pm 0.84

The values are means of triplicates \pm standard deviation.

The table IV revealed the result of the vitamin and mineral content of the dried date palm powder. The amount of β carotene in khandi was very high 273.22 \pm 5.99 and was low in barhi 66.74 \pm 0.73. β carotene have the ability to protect cells in the body from harmful effects of oxygen free radical (Jain, 2015). Minerals are required for normal cellular functions (IOM, 2004). Certain minerals play important role in maintenance of normal glucose intolerance (Choudhary, 1999). The sodium and potassium level of khandi were about 91.03 \pm 1.14 and 1674.72 \pm 7.00 respectively and the barhi were about 89.58 \pm 0.53 and 1457.94 \pm 10.84 respectively. From the obtained results potassium level of both varieties were in increased amount when compared to sodium level. The potassium value is higher when compared to the RDA of date palm fruit which has about 696mg/100g (USDA nutrient database). The increased potassium and decreased sodium level was beneficial for the people suffering from hypertension (Appel, 1997). The calcium is the most abundant mineral in the body because it regulates many cellular processes and has important structural role in living organism. From this study the amount of calcium found to be increased in khandi (41.1 \pm 1.66) and decreased in barhi (36.6 \pm 1.11). In addition, the amount of iron and phosphorous of both dates varieties were 6.4 \pm 1.32mg and 5.7 \pm 0.65mg, 70.60 \pm 1.27mg/100g and 68.53 \pm 0.84 mg/100g respectively. All the mineral content was high in khandi compared to barhi.

4. CONCLUSION

The present study, portrayed the Physical, functional and nutritional composition of two unripe date varieties. Functional properties reveals that it is a suitable ingredient to make any value added product. Among them khandi (red) found to be richer in carbohydrate, protein, fiber, vitamin and mineral content than the barhi (yellow) variety. Hence, unripe date is a nutrient rich food for recommendation.

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