

Nutritional Composition of the Fruit of the Nigerian Wild Date Palm, *Phoenix dactylifera*

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Abstract: Chemical compositions of fruit of dates were analysed. The value of carbohydrate, protein, moisture content, fibre, ash and fat were 65.00%, 17.09%, 64.34%, 12.55%, 9.8% and 9.61 respectively. The most abundant mineral was zinc with the value of 74.82 ppm and the least magnesium with value 1.00 ppm. All these quality food properties make it good source of sweetening agent in food processing industry.

Key words: Date Fruits • Minerals • Chemical Composition • Proximate Analysis • *Phoenix dactylifera*

INTRODUCTION

The date palm (*Phoenix dactylifera* L.) is one of mankind's oldest cultivated plants and has been used as food for about 6000 years [1]. It is an important food crop in Middle East and is considered to be one of the most important fruit tree particularly in North African, the Middle Eastern and Asian countries. The fruit contributes to the economy and social life within these regions [2] and it is considered as a vital component of their diet [3]. Date fruits are well known as a staple nutritious food and source of wealth for many years [4]. Because of its high nutritional value, great yields and its long life, the date palm has been mentioned as the "tree of life" [5]. The fruits of the date palms are consumed throughout the world. Dates are being consumed in modern cultures for their pleasant flavor, odor and their biting texture in addition to their use for flavoring foods, beverages and medication [3].

Date fruits are considered as major source of carbohydrate which include simple sugars like glucose and fructose [6-8] and sucrose [9]. They are good sources of dietary fibre and some important minerals which include iron, potassium, selenium, calcium and vitamins and it also contains vitamin C, B1, B2, A, riboflavin and niacin but it is low in fat and protein contents [8, 10].

Date plantation in Nigeria started since 17th century [11] through the trans-Sahara trade route from North Africa by Muslim pilgrims on pilgrimage to the Holy cities of Mecca and Medina [12]. Though Nigeria is not a major dates producer in the world, the crop thrives in Northern parts of the country particularly regions above latitude 10^o North of the equator [13]. Despite the invaluable roles of dates in human life, the Nigerian date palm industry (Production, processing and marketing) is beleaguered with lack of awareness of the nutritional importance of dates [11].

The objective of the present study was to report the nutritional data of the fruit of wild date palm in Nigeria as a means to the possible use in date paste, syrup or powder as ingredients in some food formulations.

MATERIALS AND METHODS

All date fruits sample (*Phoenix dactylifera* L.) was bought from a local market in Ile-Ife, Nigeria. After removing the seeds, the date flesh was rinsed with water, dried for 24 h at 40°C, milled and preserved in the freezer prior to analysis and extraction. All chemicals used during the present study were of the analytical reagent grade. All the analysis were carried out at the Central Laboratory Services, Institute of Agricultural Research

and Training Obafemi Awolowo University (I.A.R.&T.), Ibadan. Samples were analyzed chemically according to the official methods of analysis described by the Association of Official Analytical Chemist (A.O.A.C.) [14]. The moisture content was determined by measuring the mass of the sample before and after water is removed by evaporation. The determination of total nitrogen (N) by Kjeldahl carried out as described by AOAC [14] for the total protein content. Ash and mineral content by Larrauri [15]. The mineral constituents (Ca, Mg, K, Na, Mn, Zn and Cu) were analysed separately, using a Perkin-Elmer 2380 Model Atomic Absorption Spectrophotometer. Minerals were quantified on the basis of peak areas and comparison with a calibration curve obtained with corresponding standards. Minerals were expressed as milligrams per 100 g of fresh weight. Phosphorus content (P) was determined by the phosphomolybdate method as described in AOAC [14]. The method of phenol-sulphuric acid as described by Dubios *et al.* [16] was used for determination of carbohydrate. The total amount of carbohydrate was determined based on a standard calibration curve prepared using glucose or dextran (Average molecular weight: 2×10^6). The energy values of dates were evaluated using formula described by Crisan and Sands [17]. Lipid extraction was carried out with 2.0 g of homogenised date flesh with Soxhlet extractor with 250 ml of petroleum ether and then the solvent was removed by evaporation. Result was expressed as the percentage of lipids in the dry matter of date powder.

RESULTS AND DISCUSSION

The average proximate composition of date palm flesh is summarized in Table I. Carbohydrate was the predominant component with value of 65.0% followed by moisture, along with small amounts of protein, crude fibre, ash and fat.

Sugars are the most important constituents of dates, making them a rich source of energy for the human system [4]. The most important carbohydrate components in date fruit are glucose, fructose and sucrose, which can reach up to 70–80% [3, 18-21]. Variation in the carbohydrate concentration of date fruit can be attributed to differences in cultivar, harvest/postharvest factors and growing environment (Temperature, humidity, fertiliser use, etc.) [18, 22-24]. Borchani *et al.* [25] analysed the main chemical components of date fruits from 11 Tunisian cultivars and found that they were rich in sugar (799.3–880.2 g kg⁻¹ dry matter). Ali *et al.* [23] found that the total sugar concentration in three Omani date cultivars ranged from

Table 1: Chemical composition of date palm (*Phoenix dactylifera* L) flesh

| Components | Percent% |
|------------------|----------|
| Moisture content | 64.34 |
| Crude protein | 17.09 |
| Fat | 9.61 |
| Ash | 9.8 |
| Crude fibre | 12.55 |
| Carbohydrate | 65.00 |

(All values given are means of three determinations)

685.3 to 753.7 g kg⁻¹, the highest level being observed in Khalas cultivar. Amoros *et al.* [26] found that the total sugar concentration in Caqui 24 and Caqui 22 date fruits ranged from 424 to 542 g kg⁻¹. Mikki [27] reported that Saudi date varieties contain about 70% reducing sugars with an almost equal quantity of glucose and fructose. In this study, the value of 65.0% was obtained for the carbohydrate. This result shows that Nigerian Date is lower in sugar concentration than that of Saudi. Even though the amount of carbohydrate obtained was high this was useful for getting the energy for metabolic processes.

The high moisture content facilitates spoilage of dates and low moisture content will lead to dry dates not acceptable to consumers. In this study, the moisture content of date was 64.34%. This value is slightly different from the observation of Barreveld [28] who reported that moisture content in date fruits at different stages of development was about 50-60% for sweet khalal, fleshed varied between 9.73 and 17.52 g/100 g, being lowest in Um-sellah and highest in Shahal. Toutain [29] considered dates as soft, if they present a water content more than 30%, dry if this rate is less than 10% and half-soft if the rate is between 10 and 30%. This nomenclature permits us to classify this Nigerian date as soft date.

Date fruit can be considered as a good source of dietary fibre such as cellulose, hemicellulose, lignin, pectin, etc. [30-31]. The value of crude fibre obtained was 12.55%. Dietary fibre is known to influence digestion and absorption processes in the small intestine [32, 33]. Since the crude fibre value of date palm fruit is moderately high, if consumed it would aid digestion and absorption processes. Like the carbohydrate concentration in date fruit, the fibre concentration is also dependent on date cultivar and ripening stage [24]. Al-Shahib and Marshall [34], who surveyed the total dietary fibre contents of 13 date varieties from various countries, found that the percentage of total dietary fibre was in the range of 6.4–11.5%, depending on variety and degree of ripeness. But, Elleuch *et al.* [35] reported that the dietary fibre concentration of two Tunisian date cultivars (Deglet-Nour

Table 2: Mineral content of date palm (*Phoenix dactylifera* L) fruit flour

| Minerals | ppm |
|------------|-------|
| Magnesium | 1.00 |
| Calcium | 21.36 |
| Potassium | 54.66 |
| Sodium | 38.55 |
| Manganese | 15.69 |
| Zinc | 74.82 |
| Phosphorus | 31.96 |
| Copper | 1.69 |

Table 3: Vitamins Contents of the date palm (*Phoenix dactylifera* L) fruit flour

| Parameters | mg/100g |
|------------|---------|
| Vitamin C | 32.00 |
| Riboflavin | 3.70 |
| Thiamine | 0.81 |

and Allig) was 14.4 and 18.4% respectively. Borchani *et al.* [25] also found that the fibre concentration in 11 Tunisian cultivars ranged from 80.9 to 202.5 g kg⁻¹ dry matter. The crude fibre value of 12.55% obtained in this work is well within the range reported by Elleuch *et al.* [35] and Borchani *et al.* [25]. The low level of lipids content of 9.61% with its contents of sugars means that, the date palm is safe for the heart and high blood pressure patients because it contains a low level of fatty acids and cholesterol.

Al-Hooti *et al.* [36] reported that dates were not considered as a good source of protein. But contrary to the observation, the value of protein obtained in this report is relatively high (17.09%). Borchani *et al.* [25] analysed eleven Tunisian cultivars of date for protein and found the highest protein content of 2.85 g/100 g dry matter. This shows that Nigeria wild date is rich in protein than those found in Tunisia.

Ash content is an index to the nutritive value of foods [37]. The ash content obtained in this work was 9.8%, higher than the ash range mean values of legumes which are between 2.4 - 5.0% by FAO [38].

Date fruit contained significant amount of minerals (Table 2). Zinc concentration was the highest (74 ppm), followed in descending order by potassium (54.66 ppm), sodium (38.55 ppm), phosphorus (31.96 ppm), calcium (21.36 ppm), manganese (15.69 ppm), copper (1.69 ppm) and manganese (1.00 ppm). This order did not follow that reported by Al-Hooti *et al.* [39]. The mineral composition showed that the dates were relatively low in sodium but rich in potassium. This low sodium: potassium ratio made the date a desirable food for persons suffering from hypertension [36, 40]. The relatively high calcium content is essential for healthy bone development and energy metabolism.

Date fruits may be considered as an almost ideal food providing a wide range of essential nutrients and potential health benefits [39]. Vitamins are essential micro-nutrients for organisms' multiple biochemical reactions. The results showed that the date is very rich in vitamin C followed by riboflavin and thiamine (Table 3).

CONCLUSION

Dates are cheap to produce and are very rich in nutrition. Considering sugar, fibre and protein contents of date flesh, the food scientist could be encouraged to develop new source of food supplements. Also, the mineral contents in the date sample have the potential to provide a good source of zinc, potassium, calcium and sodium in the diet.

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