

## EVALUATION OF PHYSICOCHEMICAL PROPERTIES, PROXIMATE COMPOSITION AND SENSORY QUALITIES OF ROASTED DATE SEED POWDER

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### Abstract

Although date seed has been reported useful in the manufacturing of food products globally, not much attention has been paid to the composition and quality attributes of the variety (*sukur cv.*) most consumed in Nigeria. This study utilized a combination of experimental and descriptive research design with a view to underscoring the quality attributes and acceptability of date seed beverage for domestic use.

25kg of dry date fruits were deseeded and the seeds were roasted and blended into powdery form. The colour, bulk density, PH, mineral constituents and nutrient composition were examined to ascertain the physicochemical properties and proximate composition of the product while sensory analysis was carried out by utilizing 10 panelists to assess the sensory qualities of the beverage in four different samples servings.

The physicochemical properties reveals bulk density: 0.53g/ml, solubility index: 81.35%, lightness: 61.32, redness: 16.71 and yellowness: 14.92pH: 6.25, potassium: 72.81mg/100g, calcium: 62.21mg/100g, magnesium: 56.25mg/100g, zinc: 0.43mg/100g, iron: 0.93mg/100g. The proximate composition reveals 5.95% moisture content, 94.09% dry matter, 14.41% crude fat, 21.7% crude protein, 6.15% ash and 43.68% carbohydrate. Date seed beverage served with milk and sugar added was the most acceptable followed by the beverage served with milk only in terms of colour, taste, aroma, and appearance.

The study concludes that date seed beverage contains essential minerals and nutrients required for healthy living, and it is mostly acceptable for consumption when served with sugar and milk. It is recommended that the beverage can be served in homes and hospitality outfits.

**Keywords:** *Physicochemical Properties, Proximate Composition, Sensory Qualities, Date Seed*

### Introduction

According to Food and Agricultural Organisation (2012), date (*Phoenix dactylifera*) plays an important role in the nutrition and socioeconomic activities of the people. In Nigeria, date seed being the endocarp part of the date fruit is grossly

underutilized after the consumption of the fleshy mesocarp layer. It is usually discarded, making the value chain of date not completely exploited. The date seeds are considered a waste product of many date processing plants producing pitted dates, date syrup and date confectioneries.

However, it has been reported that date seeds are used mainly as animal feeds by the cattle, sheep, camel, and poultry industries. Also, it has been reported to have many economic potential as it has been used as part of the materials for flour, and the preparation of cakes, breads, pastries and others (Rahmadi & Kurma, 2010) owing to its high quality protein content. In some cases, the seeds are processed into powder and used as a beverage, further underlying the potential of date in the food industry.

Roasted and powdered date seeds are used by some rural communities as coffee substitutes and coffee-like preparations made from date seeds are available in some markets (Hussein, Alhadrami & Khalil, 1998). It was postulated that roasting date seeds into coffee-like beverage could represent an alternative product for those who want to enjoy the characteristic flavor and aroma of coffee without raising caffeine intake level (Habib, Platat, Meudec, Cheynier & Ibrahim 2014). Many types of beverages are available in Nigeria but the date seed beverage is yet to be widely accepted in Nigeria. The introduction of date seed beverage will serve as alternative to other known beverages that contain chemically induced flavour and sugar content. The absence of caffeine and the high levels of total phenolic compounds in the date seed extracts can serve as a strong motivating factor for those individuals who want to enjoy characteristic flavor of the beverage without raising daily caffeine intake (Sami, Syed, Azharul & Afaf, 2016). Hence, this study could form basis for developing blended date seed powder for consumption in Nigeria.

Baliga, Kandathil, Bhat, & Vayalil (2011) described and patented a roasting process of three different types of interventions resulting in the making of products that

look like coffee in taste and texture. In these interventions, the date kernels were subjected to different types of roasting regime ranging from 150-300°C. However, information regarding the safety, physical and chemical characteristics of roasted date seed extracts as beverage is not available. There is paucity of information on date seed composition and its utilization, especially the cultivar that is most common in Nigeria (*sukur cv.*) It is on this premise that this study focuses on the evaluation of physicochemical properties, proximate composition and sensory qualities of roasted date seed beverage.

### **Aim and Objectives**

The aim of the study is to evaluate the physicochemical properties, proximate composition and sensory qualities of roasted date seed beverage. This was achieved through the following objectives

- i. Determine the physicochemical properties of roasted date seed powder
- ii. Examine the proximate composition of roasted date seed powder
- iii. Assess the sensory attributes of roasted date seed beverage served with varying additives

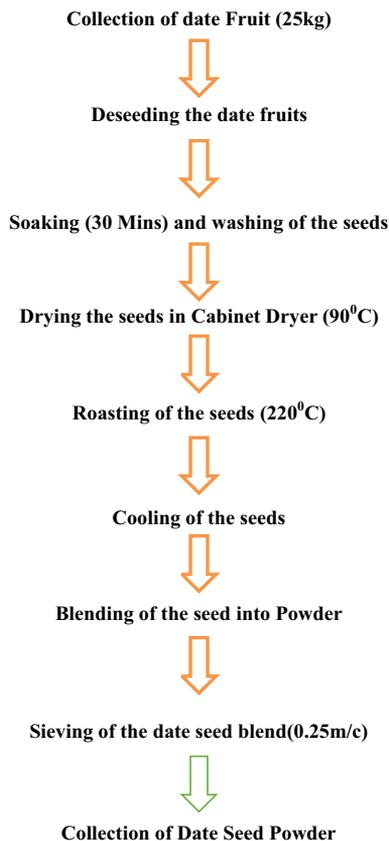
### **Materials and Methods**

A combination of experimental and descriptive research design was utilized for the study. The experimental design applied to the product development and analysis of its physicochemical and proximate composition because experimental research allows the researcher to control the situation. In so doing, it allows researchers to answer the question, "what causes something to

occur. While the descriptive research design applied to the sensory qualities of the product because descriptive research designs help provide answers to the questions of who, what, when, where, and how associated with a particular research problem. Descriptive research is used to obtain information concerning the current status of the phenomena and to describe "what exists" with respect to variables or conditions in a situation.

To produce the date seed powder, twenty kilograms (20kg) of dry date fruit was obtained from Eleweran Market in Abeokuta, Nigeria. The fruit was manually cleaned and deseeded. The seed was then cleaned with tap water to remove

any adhering fruit material. The seeds were dried in the cabinet dryer (Genlab drying cabinet, Model DC500, Serial Number 123514) at 80°C for 8 hours to remove the excess moisture. Then, the seeds were roasted in an electric oven (Heng-wei Electric oven, Model ELE-S02, Serial Number PC1312243) at 220°C for 30 minutes and allowed to cool. The seeds were blended into powdery form using Binatone Blender, (Model Number BLG-450 MK2) and sieved with a 250 $\Omega$  mesh size stainless steel (Fisherband Test Sieve; Model Number BS410-1:200; Serial Number 0306932) to obtain a fine date seed powder.



**Figure 1: Roasted Date Seed Powder Production Flowchart**  
(Adapted from Abdillah &Margareta.2012)

The laboratory materials and equipment that was used for the analysis include: Hot air oven, muffle furnace, moisture extraction oven, desiccators with silica gel, Top-loading and analytical balances, Aluminum or porcelain, silica dishes, Spatulas, labelling papers, thimbles, flask, water jacketed condenser, Pipette, conical flask, Hot air oven, crucible, muffle furnace, distillation apparatus, soxhlet apparatus, measuring scale, sterile glass wares which includes: petri dishes, conical flask, pipette, crucible, distillation apparatus, soxlet apparatus and measuring cylinder and sterile disposable gloves (as found in Niazi, Rasheed, Khan & Safda. 2017). All materials that was used in the course of this experiment such as glass wares were properly washed with detergent and water to remove dirt and contaminations and dried properly. The washed wares were sterilized in the laboratory using ultra-violet rays at a temperature of 121 °C for 15 minutes (as suggested by Bukar, Isa, Garba, Muhammed & Suleiman, 2015). Laboratory experiment was conducted to determine physical parameters and chemical parameters and this includes, colour, PH, bulk density, minerals, moisture content, protein content, fat content, ash content, Crude fibre etc. Data

collected were subjected to three-way analysis of variance, and treatment means were separated using Tukey's HSD (Honestly Significant Difference) test. Sensory qualities of the beverage prepared was assessed by ten (10) trained panelists who reported data for the four (4) different samples served, with a view to underscoring the quality attributes (which include: colour, taste, aroma, appearance and overall acceptability) in a controlled environment in order to minimize external environmental influence. The samples were scored based on a nine-point hedonic scale where 1 equals extremely dislike and 9 equals extremely like.

### Results and Discussion Physiochemical Properties of Freshly Produced Roasted Date Seed Powder

The result showed that date powder had a moisture content of 5.88%, bulk density of 0.53 g/ml, solubility index of 81.35 %, pH of 6.25, potassium of 72.81 mg/100g, calcium of 62.21 mg/100g, magnesium of 56.25 mg/100g, Zinc of 0.43 mg/100g, iron of 0.93 mg/100g, Lightness of 61.32, Redness of 16.71 and yellowness of 14.92. This is in agreement with the report of Habib and Ibrahim (2009) on the chemical composition of date seed.

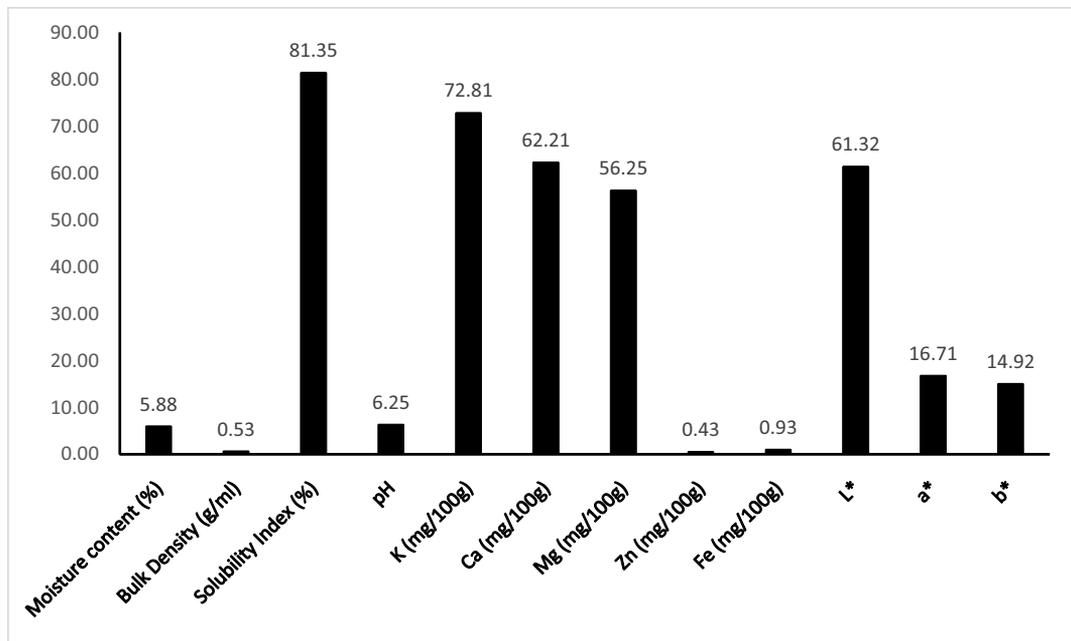
**Table 1: Physiochemical Properties of Freshly Produced Roasted Date Seed Powder**

Moisture content	Bulk density	Solubility index	PH	K Mg/100 g	Ca Mg/100 g	Mg Mg/100 g	Zn Mg/100 g	Fe	L*	A	B*
5.88	0.53	81.35	6.25	72.81	62.21	56.25	0.43	0.93	61.32	16.71	14.92
									32	71	

Color: L\* (Lightness), A\*(Redness/Greenness) and B\*(Yellowness/Blueness)

The bar chart below shows that in terms of mineral composition, date seed has high concentration of potassium followed by calcium and magnesium while, the concentration of zinc and iron is in a micro scale. From the color, L\* is the

highest followed by A\* then B\*; this indicate lightness in the substance produced. Bulk density is 0.53, moisture content is 5.88, PH is 6.25 and solubility density is 81.35



**Figure 2: Physicochemical Properties of Freshly Produced Roasted Date Seed Powder**

#### Proximate Composition of Freshly Produced Roasted Date Seed Powder

The proximate composition of freshly produced roasted date seeds powder is shown in Table 2 below. The results showed that the freshly produced date seeds powder had 5.95 % moisture, 94.09 % dry matter, 14.41 % crude fat, 6.15 % Ash, 8.26 % crude fibre, 21.7 % crude protein and 43.68 % carbohydrate. This

implies that the beverage produced from this product would be a good nutritional source of carbohydrate, protein and dietary fibre. This is in line with the findings of Besbesa, Bleckerb, Deroanneb, Drirac, & Attiaa,. (2004) on range values reported for proximate composition of some selected varieties of date seeds.

**Table 2: Proximate Composition of Freshly Produced Roasted Date Seed Powder**

Parameters (%)	Values
Moisture content	5.95
Dry matter content	94.09
Crude fat	14.41
Ash	6.15
Crude fibre	8.26
Crude protein	21.7
Carbohydrate	43.68

**Sensory Qualities of Roasted Date Seed Beverage**

The roasted date seed powder was used in preparation of four different samples of beverage and served to ten (10) panelists. From table 2 below, the result obtained indicated that the beverage

colour (8.33), taste (9.00), aroma (8.67), appearance (8.00) and overall acceptability (8.67) were most acceptable when served with milk and sugar, compared to other samples while the beverage served bland was the least accepted.

**Table 3: Sensory Analysis by the Taste Panelists**

Sample	Colour	Taste	Aroma	Appearance	Overall acceptability
<b>Bland beverage</b>	6.67	5.00	7.33	6.00	6.67
<b>Beverage + milk</b>	8.33	7.33	8.00	8.00	8.00
<b>Beverage + sugar</b>	6.67	5.67	5.67	6.33	6.33
<b>Beverage + milk and sugar</b>	8.33	9.00	8.67	8.00	8.67

### Conclusion and Recommendation

The physicochemical properties, proximate composition and sensory qualities of date seed (*sukur cv.*) was investigated in this study. A coffee like brew prepared from roasted date seeds in this study is considered as a bioactive drink that can be used as a therapeutic beverage for people who are deficient in some of the essential minerals found in the product. Based on the outcome of this study, the roasted date seed powder is rich minerals such as, potassium, calcium, magnesium and considerable amount of iron and zinc. Date seed powder is equally highly nutritious considering its rich carbohydrate, protein, crude fat and fibre content. The date seed beverage is generally acceptable either served bland, or with the addition of sugar or any other sweetener or served with the addition of sugar and milk. However, the most acceptable is the beverage served with sugar and milk. The study concludes that the beverage contains edible macro and micro nutrients and no traces of toxic substances hence, can be served in homes and hospitality outfits. The study recommends that the seed of date fruits commonly found in Nigeria (*sukur cv.*) is synonymous to every other variety that has been reported. Hence, the product is recommended for human consumption at home and hospitality outlets.

### Limitation of Study

This study is constrained by time and funds, hence the product evaluation is limited to freshly produced samples only. Further research should consider suitable packaging material(s) and storage condition(s) for the date seed beverage in order to ascertain the shelf life of the product.

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