Journal of Food Processing & Technology
ISSN: 2157-7110

Nwanekezi et al., J Food Process Technol 2015, 6:9
DOI: 10.4172/2157-7110.1000484

Research Article Open Access

Effect of Substitution of Sucrose with Date Palm (*Phoenix dactylifera*) Fruit on Quality of Bread

Nwanekezi EC*, Ekwe CC and Agbugba RU

Department of Food science and Technology, Faculty of Agriculture and Veterinary Medicine, Imo State University, Owerri, Sudan

Abstract

The proximate, physical and sensory analysis of bread samples produced by substituting the level of sucrose with date palm fruit pulp (50:0 g, 37.5:12.5 g, 25:25 g, 12.5:37.5 g and 0.50 g) was investigated. The proximate analysis revealed that the protein, moisture, ash, crude fiber and fat contents increased with increase in the level of the date palm fruit pulp. There were increases in the levels of nutrients which ranged from 15.19-19.43% (protein), 1.65-4.43% (crude fiber), 2.44-4.11% (ash) and 28.19-28.92% (moisture). However, there was decrease in the level of carbohydrate content from 45.39 to 35.13% as the level of date palm pulp increased. The specific volume also decreased as the level of the date palm fruit increased ranging from3.12 cm^3/g to 2.93 cm^3/g; the addition of date palm fruit pulp had no effect on the loaf volumes which ranged from 1920.1 to 1925.0 cm^3. The sensory analysis, using a 25-man panel of judges revealed that all the loaf samples were acceptable organoleptically. However, the substitution of sucrose with date palm fruit pulp powder increased the nutritional value of the bread samples.

Keywords: Sucrose; Date palm; Carbohydrate; Bread samples

Introduction

Bread is a food product that is universally accepted as a very convenient form of food that has desirability of all population, rich and poor, rural and urban. Its origin dates back to the neolithic era and is still one of the most consumed and acceptable stable in all parts of the world [1]. In Nigeria, bread has become the second most widely consumed and non-indigenous food product after rice and has become an important source of food to Nigerians. It is consumed extensively in most homes, restaurants and hotels [2].

One of the ingredients for bread-making is sugar. Sugar is the primary food for the yeast [3]. In the course of bread-making, the wheat flour dough is fermented with yeast. Fermentation is a process by which yeast acts, on sugar and changes them into carbondioxide gas and alcohol (Gisslen). The release of carbondioxide gas produces the leavening action in breads. Other roles of sugar in bread making according to Bali [3] are: It helps to improve the crust color through browning reaction. Sugar acts as preservative as it is anti-staling agent. It helps bread to retain moisture by keeping the bread moist. It acts as bread improver and imparts flavor to bread. Sugar also tenderizes the bread by preventing gluten formation [4].

Fermentable sugar in bread dough comes from two sources. It is added to the dough by the baker and it is produced from flour by enzymes that break down the wheat starch into sugar (Gisslen). The concentration of added sugar in bread dough varies from none to about 8% or a little higher [5].

Date palm fruit *(Phoenix dactylifera)* is a delicious fruit with a sweet taste and a fleshy mouth feel. The major component of date fruits are carbohydrates (mainly the sugars; sucrose, glucose and fructose), which may constitute about 70% [6]. The sugars are easily digested and can immediately be moved to the blood after consumption and can quickly be metabolized to release energy for various cell activities. Date fruits are a good source of fiber and contain very important vitamins and minerals, including significant amounts of calcium, iron, fluorine and selenium [6]. The date fruit can be used as a practical supplement for iron deficiency without any side effects. At least six vitamins (thiamine, riboflavin, niacin, ascorbic acid, pyridoxine and vitamin A) have been reported to be present in dates in visible consideration [7].

Nigeria spends most of its foreign exchange on importation of sugar. This foreign currency spent on sugar importation depletes the country's foreign exchange reserve. Complete replacement of sucrose with date palm fruit in bread making will not only save substantial fraction of foreign exchange expended on importation of sugar but will also uplift the nutritional profile of bread in view of numerous nutrients in date palm fruit.

Therefore, the aim of this study is to evaluate the quality of bread made with date palm fruit in place of sugar (sucrose).

Origin and distribution of date palm

Phoenixdactylifera L., date palm is among the most important species in the palm family (*Arecaceae*), which encompasses about 200 genera and more than 2,000 species [8,9] and includes *P. Canasiensis*(Canary Islands date palm) *P. Rechinata*(Senegal date palm) and *P. Slyvestris*(India sugar palm). The species name was inspired by the finger like shape of the fruit and the genus from the legendary bid of ancient Greece.

Historically, date palm cultivation was practiced by ancient civilizations and in nowadays considered one of the oldest domesticated fruit-bearing trees. Remains of date palms were found in Jericho-the oldest site town to date to be the origin of agriculture. Date palm cultivation gained socio-economic importance among tribes and countries due to its ecological plasticity and high adaptation to and conditions where the annual precipitation rarely exceed 250 mm combined with hot summers up to 50°C and cold writers down to 10°C [8].

***Corresonding author:** Nwanekezi EC, Department of Food science and Technology, Faculty of Agriculture and Veterinary Medicine, Imo State University, Owerri, Sudan, E-mail: chibyzaps@gmail.com

Received May 11, 2015; **Accepted** July 03, 2015; **Published** July 10, 2015

Citation: Nwanekezi EC, Ekwe CC, Agbugba RU (2015) Effect of Substitution of Sucrose with Date Palm (*Phoenix dactylifera*) Fruit on Quality of Bread. J Food Process Technol 6: 484. doi:10.4172/2157-7110.1000484

Phoenix dactylifera is a widely distributed species occurring in diverse geographic soil and climate areas [10]. The vast majority of the trees are located in the Middle East and North Africa although the crop has been established in California, Arizona and Mexico in the Americas. The common requirement among all date palm growing areas is the high temperature (35°C) necessary for an optional development of pollen and the low relative humidity for fruit setting and ripening. Such desert-adapted tree large quantities of water drawn from deep in the soil through a well-established root system or from surface irrigation. Date palm grows in nearly rainless regions at 9-39°C North latitude, which are represented by the Sahara and Southern fringe of the Near East (Arabia Peninsula, Southern Iraq, and Jordan).

FAO estimates that the harvested area of date growing was 1.3 million ha in 2009 (FAO statistics).

Edible dates go through four ripening stages termed kimri, khalal, rutab and tamr(Fayadh and AL-Showimann). These represent the immature astringent green, mature full, coloured, soft brown and hard raising-like stages of development, respectively. In first 4-5 weeks, the dates are full green and become kimri at this stage, average fruit size is 27.5 mm long x 17.8 mm in diameter and weighs 5.8 g an average, quickly increasing due to the accumulation of carbohydrates and moisture content. Acidity is quite high at this stage with an average protein level of 5.6%, fat 0.5%, and ash 3.7% [11]. In the Khalal stage, the fruit colour changes from green to yellowish/reddish tone depending on the colour, over a period of 3 to 5 weeks. Sugar and moisture content decreases from values recorded at the kimri stage along with a decrease in acidity. In this stage, the fruit averages 32.5 mm in length and 21 mm in diameter while the fruit weight increases to 8.7 g [11].

The percentage of protein, fat and ash decrease to 2.7, 0.3 and 2.8% respectively. At the rutab stages, dates begin to soften (2-3 weeks period) due to an increased loss of moisture content and an increase of enzymatic activities of pectinases and poly galactinosases. The protein, fat and ash percentage in this stage decrease to 2.6, 0.3 and 2.6% respectively. At the tamr stage, dates and drier and rather firm in texture while their colour turns to a darker one.

The date palm commonly known as "Dabino" by the Hausa tribe is believed to have been introduced into Nigeria in the early 17th century through the trans-Sahara trade made from North Africa and Muslim Pilgrims in Pilgrimage to the Holycities of Mecca and Medina [12].

Date palm fruit is grown in Northern Nigeria including Kaduna, Katsina, Kano, Sokoto, Kebbi, Jigawa, Yobe, Bonu, Gombe, Bauchi and Adamawa States. Other states including Plateau, Taraba, Nassarawa, Southern Kaduna and Niger State could be classified as marginal areas for date palm cultivation in the country [13]. Date production in Nigeria has two fruiting seasons (Dry and Wet season fruits), but only the dry season fruits is economically useful. Date palm cultivation has remained restricted to compound, homesteads and few orchards in the Northern part of the country. The statistical of the annual date production in the country from the studied states deduce so far is over 21,000 metric tonnes from the available data shown in Table 1.

Harvest and post-harvest handling of dates

Dates are harvested at or near maturing; harvest is generally by hand with access to crown of the tree being by way of climbing or mechanical lifts. Completely mechanized harvest shakers used in some perennial crops is not developed enough for routine commercial use at this time [14]. In many traditional areas of date production, where the bulk of production is by small farms with limited resources, dates are usually transported directly to open air markets. Because of their low moisture content, dates can be successfully stored for sometimes without specialized storage conditions.

Physiological and pathological factors which and lower the fruit quality include: black nose, associated with high humidity during the Khalal storage, black scald, associated with abnormally high temperature and humidity storage conditions may be promote fruit defects such as darkening of the skin and sugar spots. In addition, dates are sometimes attacked by various pathogens including *Aspegillus, Alternaria, Penicillum.*

Diet contribution and uses of date fruits

Besides the use of fresh fruits for human consumption a number of by-products derived from dates also have various uses. These include Jam, Jelly, Juice, Syrup and fermented beverage [15]. Cull dates from grading and sorting, as well storage and conditioning are often utilized as animal feed. Several reports show that a number of bacteria compounds can be extracted from these by-products, thereby adding industrial value which could compensate for the economic loss from under-grading and/or deterioration. Various, metabolites also are reported to be produced from dates or their by-products, such as citric acid, oxytetrachine and ethanol [15].

Dates represent an important nutritional element in the diet population where the trees are grown. Dates contain a high percentage of carbohydrate (total sugars, 44-88%), protein (2.3-5.6%), fat (0.2-9.3%) and essential fibre (6.4-11.5%) and the seed (7.7-9.7%). Dates are known for numerous other nutritional properties due to their redness in non-starch polysaccharide and liquid [16]. Other nutritional properties include a number of the anti-oxidant molecules such as polyamine, phenolics, tannins and glutathione known for their health enhancement attributes.

Bread

According to Pomeranz and Shellenbergerthe history of bread is almost as old as the history of making, since it has long been used as a sacred symbol in religious ceremonies. In ancient times, the Egyptians used it as both sacrifice and a tribute to their gods. Today Christianspotray the body of Christ at communion with bread. Bread

S.NO	States	Annual Production in Metric Tonnes (MT)
1	Adamawa	200
2	Bauchi	6,000
3	Borno	1,000
4	Gombe	1,500
5	Jigawa	5,000
6	Kano	6,000
7	Plateau	Insignificant
8	Taraba	Insignificant
9	Yobe	2,000
10	Kaduna	-
11	Nassarawa	-
12	Katsina	-
13	Zamfara	-
14	Kebbi	-
15	Sokoto	-
	Total	**21,700 (MT)**

Source: Abdul – Qadir et al.,

Table 1: Statistics and annual date's production in Nigeria.

has many variations depending on the shape, size, texture, colour and taste [17].

Bread products are well accepted worldwide because of their low cost, ease of preparation, versatility, sensory attributes, convenience and nutritional properties. Bread in human nutrition is not only a source of energy, but also supplier of irreplaceable nutrients for the human body. It provides little fat, but high qualities of starch and dietary fibre as well as cereal protein. Apart from that, bread contains to B group vitamin and minerals which are mostly magnesium, calcium and iron [18].

Types of bread

According to Serrem et al. [19], there are different types of bread which include:

α) **White bread:** This is made from flour, contains only the central core of the grain (endosperm).

β) **Bran bread:** This is made with endosperm and about 10% brain. It can also be referred to as white bread with added colouring often caramel colouring to make it broom, this is commonly labeled in America as wheat bread (as opposed to whole wheat bread). It contains the whole grain (endosperm and bran). It is also referred to as "whole grain" or "whole-wheat bread", especially in Non-America.

χ) **Wheat germ bread:** This has added wheat germ for flavoring whole-grain bread. It can also be referred to as whole meat breads or wheat bread with added white grains to increase its fiber content as in whole grain bread.

δ) **Unleavened bread:** This is used for the Jewish feast Passover; it does not include yeast which is responsible for rising.

ε) **Crisp bread:** Crisp bread is a flat and dry type of bread or cracker containing mostly rye flavor.

ϕ) **Flat bread:** Flat bread is often simple, made with flour, water and salt and then formed into flattened dough; most are unleavenedmade without yeast or sour dough culture, though some are made with yeast.

Baking ingredients

There are several ingredients involved in the production of bread. Some of the ingredients are mandatory (flour, water, yeast, salt), while others are optimal (sugar, milk, salt, flavor, fat, emulsifiers) [20].

- **Flour:** Contains starch, proteins, and lipids. Approximately 80-90% of the total wheat proteins are storage proteins and they play major role in bread production because of its essential functions in bread structure. The gluten network forms when flour is combined with water and some energy input [21]. It is crucial for the retention of air and carbohydrate during bread-making and this gives bread its structure.
- **Water:** Water acts as a solvent during the formation of bread dough. When all the ingredients are mixed together for dough formation, water hydrates the flour, the yeast is dispersed [21]. Secondly, water acts as a plasticizer during mixing and after baking [21].
- **Yeast:** Produces CO_2 for leavening the bread [22]. Yeast fermentation produces reducing sugars, which interacts with the dough proteins in the surface, under the influence of heat. This process is known as the Millard reaction which causes browning of the bread crust and contributes greatly to bread flavor [23].
- **Salt:** Sodium chloride (salt) is included at levels of about 2% in bread making [24]. The main reasons for adding salt are to:
  - Develop flavour: Without salt bread is tasteless, salt also intensifies the bread flavor developed by other ingredients [17].
  - Retard fermentation: Salt is used to control fermentation [22].
  - Strength of the Gluten: By suppressing the repulsion charges and increasing the molecular interaction between protein chains [25].
  - Affects the colour crust.
- **Sugar:** Sugar is the basic source of energy which yeast converts into CO_2 during dough proofing. Sugars are usually used by yeast during the early stages of fermentation. Later more sugars are released by the action of enzymes in the flour and then used for gas production. The concentration of sugar used in dough depends on the type of the product and desired crust characteristics. Sugar is added to provide pleasant flavor and to develop a desired crust colour [26]. The reason why most bread recipes call for sugar is to impart sweetness. It is also a source of fermentable carbohydrate for yeast especially when flour is low in amylolytic activity [27]. Other functions of sugar in bread include the improvement of texture of the crumb, retention of the moisture in the crumb and adding to the nutritional value of the bread. Some natural alternatives of white sugar for bakery products are: raw honey, maple, syrup, molasses, corn syrup, steria, xylitol, agara, nectar, brown rice syrup, evaporated cane juice, black strap molasses, date sugar and organic sugar have been listed by Anon [28], Phillips [29] and Khan [30] reported that one cup of date sugar is equivalent to one cup of granulated or brown sugar. Dates are dried and then grind into a powder to make date sugar. This sugar is high in fibre, vitamins and minerals. The substitute with white sugar is 1:1 [31].
- **Lipids:** Lipids can be used in bread-making either in the form of fats or oils and are usually referred to as shortening. Lipids also improve the keeping quality, softness and moistness and contribute to bread texture. Lipids embedded into the protein matrix are essential as they interact with proteins during dough mixing and contribute to the visco-elastic properties of the gluten network, required for expansion and gas retention during proofing [32].

Bread production process

α) **Mixing:** According to Dendy and Dobraszizky [33] mixing serves the purpose of blending and hydrating the dough ingredients, developing and aerating the dough.

β) **Proofing:** Proofing is known to be cardinal step in the bread making process. This step is necessary to produce the highly leavened structure with bread [33]. The bubble structure which was formed while mixing expands during proofing and will be set during baking. Thus, during proofing the visco-elastic gluten complex is transformed into a continuous three dimensioned dough network [34].

χ) **Baking:** Baking results in series of physical, chemical and bio-chemical changes in bread. The reaction includes volume expansions, evaporation of water, formation of a porous structure, denomination of protein, gelatinization of starch, crust formation and "reaction" protein cross linking, method

of fat crystals and their incorporation into the surface of air cells, rupture of gas cells and sometimes fragmentation of cell walls [35].

δ) **Cooling:** Heat transfer and evaporation are the characteristics methods by which a loaf of bread is cooled.

ε) **Packaging:** One major purpose of packaging is to provide accurate nutritional information to consumers. The bread package also functions to keep the bread together and maintain product quality (Tables 2 and 3).

Nutritional value of bread

Like all other foods of cereal origin, bread is eaten mainly as a cheap source of energy. It contains about 40-45 percent available carbohydrate and has an energy value of 900 – 1000 kg/100 g. Because considerable amount of bread are eaten, its other constituents also contribute substantially to the daily intake of nutrients. It contains 8 – 9 percent protein and significant amounts of minerals and vitamins [36].

Materials and Methods

Material collection

The date palm fruit was brought at Ama-Hausa, Douglas, Owerri Imo State. Other ingredients like fat, wheat, flour, sugar, milk and salt was brought at Eke-ukwu market, Owerri, Imo State.

Sample preparation

Date palm powder was produced first by removing the seeds of the fruit manually with the aid of knife and weighing the dried palm fruit. The date palm fruit was washed with water to remove adhering dirts. The de-seeded fruit was then oven dried at 65°C for 8 h and subsequently milled using hand milling machine (Figure 1).

Bread production process

The bread was produced using the straight dough method. Date palm fruit pulp (DPFP) was used as a replacement for granulated sugar at the following ratios: 100:0, 75:25, 50:50, 25:75, 0:100 (sugar: DPFP), which was at these percentages 0, 25, 50, 75, and 100% of sugar with DPFP. The dry ingredients were measured in the required quantities and mixed; water was added to form the dough and mixed thoroughly. The dough was kneaded until smooth and the air spaces became small. The dough was allowed to proof at room temperature 30-45 minutes. The dough was baked in a hot oven (230°C) until golden brown (Figure 2).

Analysis

Ash was determined by the furnace maceration gravimetric method [37]. The moisture content was analyzed using the method described by AOAC [38]. Crude fibre was determined using the Weendemethod. James [39]. Crude protein was determined using the kjeldahl method Chang [40]. Fat content was determined using the soxlet continuous extraction gravimetric method by Min and Boff [41]. Carbohydrate was calculated by difference as the Nitrogen free extractions (Bemiller) (Figures 3 and 4).

Sensory evaluation

Sensory evaluation was conducted for the bread samples by a Twenty-five member semi-trained sensory panel. They were asked to access for taste, texture, smells, crumb colour, crust colour and general acceptability using 9-point hedonic scale. The scale ranged from nine for "extremely like" to "dislike extremely" one (1). They were instructed to take one or two bites, slowly masticate the product before rating the sample and take over all acceptances [42].

S/N	Characteristics	Requirements
a	Specific Volume (min)	4.0
b	Moisture (%) max)	40.0
c	Total solid content (%) (min)	60.0
d	Protein (%) (min)	10.0
e	pH of the aqueous extracts	5.3 – 6.0
f	Ash content (%) (max)	0.6
g	Acid insoluble Ash (max)	0.5
h	Fat content (%) (max)	2.0
i	Crude fibre (%)(max)	0.5
j	Carbohydrate (%) (max)	48.0
k	Energy (kj/100g): on dry basis	900 - 1000

Source: SON (2004)

Table 2: Analytical values of white bread using standard formula.

		(g)			
Ingredient	**S100/0**	**S75/25**	**S50/50**	**S25/75**	**S0/100 (%)**
Sugar	50	37.5	25	12.5	-
Date palm fruit powder	-	12.5	25	37.5	50
Wheat flour	500	500	500	500	500
Baking yeast	50	50	50	50	50
Baker's yeast	20	20	20	20	20
Common salt	9	9	9	9	9
Water (ml)	275	275	275	275	275
Ascorbic Acid	0.25	0.25	0.25	0.25	0.25

$S^{100}/_{0}$ = Bread with 100% sucrose
$S^{75}/_{25}$ = Bread the sucrose was substituted with 25% date palm fruit pulp
$S^{50}/_{50}$ = Bread the sucrose was substituted with 50% date palm fruit pulp
$S^{25}/_{75}$ = Bread the sucrose was substituted with 75% date palm fruit pulp
$S^{0}/_{100}$ = Bread the sucrose was completely replace with date palm fruit pulp.

Table 3: Recipe of different substitution of sucrose with date palm (phoenix dactylifera) fruit on quality of bread.

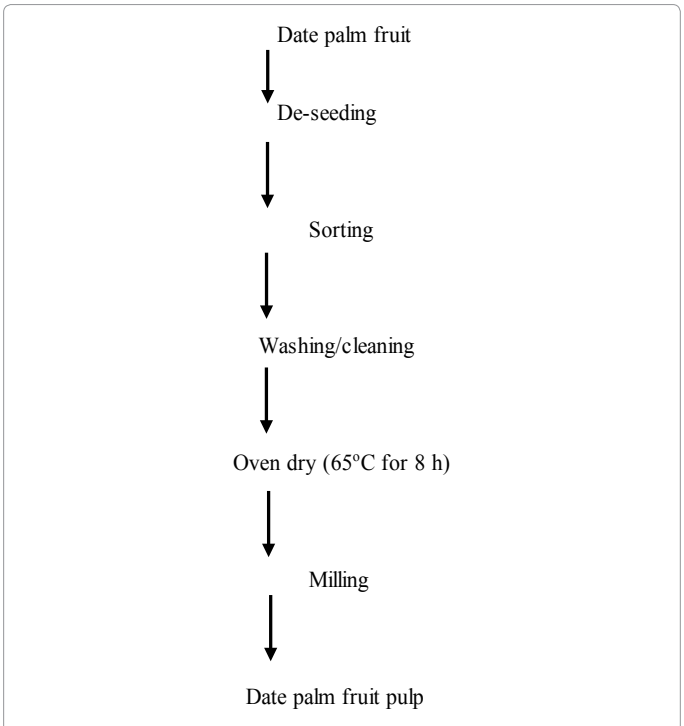

Figure 1: Flow chart for production of date palm fruit powder.

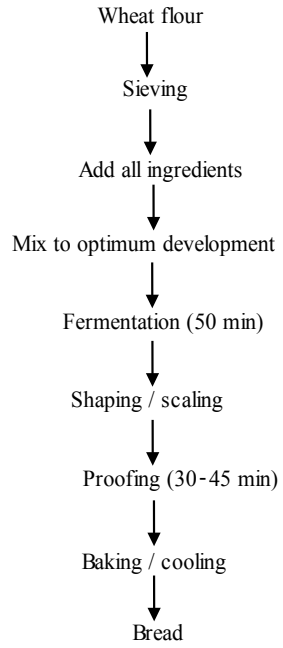

Figure 2: Flow process for Bread Production.

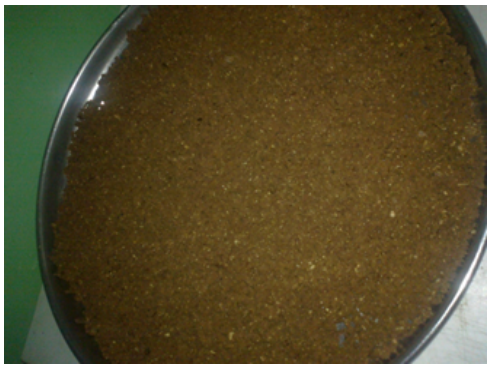

Figure 3: Date palm fruit pulp.

Figure 4: Bread samples during baking.

Loaf volume and specific volume determination

The volume of the loaf was determined by seed displacement method [38] with slight modification. Rice grains were used in place of rape seed. The grains were layered in the box of known dimension. Bread loaf was inserted and the grains poured to fill the remaining space till the grains were running over. A straight edge rule was used to level the grain. The volume of the grain was measured using a measuring cylinder and the volume of bread loaf calculated as the volume of the rectangular box less the volume of rice grain. Loaf specific volume was calculated as the ratio of loaf volume of its weight.

Statistical analysis

The data obtained from the study was statistically analyzed using one factor randomized design, analysis of variance (ANOVA). The means were separated using fishers Least significant difference (LSD) [43].

Results and Discussion

Proximate composition

The carbohydrate content of the bread samples, their sugars (sucrose) were substituted at varying levels with date palm *(Phoenix dactylifera)* fruit pulp which ranged from 45.39 to 35.13%. The carbohydrate content of the loaves was found to decrease significantly ($P < 0.05$) with increase in the level of date palm fruit pulp (Table 4). This is due to replacement of sucrose, a carbohydrate with date palm fruit pulp which contains other nutrients apart from sugar. Also the protein, moisture, ash, crude fibre and fat increased significantly ($P < 0.05$) as the level of date palm fruit pulp increased. This agreed with work of Sadiqet al. [44] that the increase in protein, presence of significant quantity of these nutrients in the bread could greatly improve the nutritional quality of bread and this is highly beneficial to consumers.

However, significant difference ($P < 0.05$) existed between 100% sucrose bread sample $S^{100}/_{0}$, 25% ($S^{15}/_{25}$), 50% ($S^{50}/50$), 75% ($^{25}/_{75}$) and 100% ($S^{0}/_{100}$) in carbohydrate and crude fibre. There were no significant differences between 75% ($S^{25}/_{75}$) and 100% date palm fruit pulp ($S^{0}/_{100}$) in protein, 100% sucrose bread sample ($S^{0}/_{100}$) and 25% ($S^{75}/^{25}$) in ash and between 50% ($S^{50}/_{50}$) and 75% ($S^{25}/_{75}$) in fat content (Table 5).

Physical analysis

The physical characteristics of the five loaves samples are similar, most especially the volumes which showed no significant difference. The bread volumes ranged from 1920.1 to 1925 cm^3 in terms of specific volume, loaf sample with 100% sucrose had the highest specific volume of 3.12 cm^3/g which was only significantly higher ($P < 0.05$) than the loaf sample with 100% date palm fruit pulp but was similar with the other three loaf samples their sucrose were substituted 25%, 50% and 75% date palm fruit pulp. This result agreed with Obiegbuna et al. [45] stating that specific volume is a function of hydration and the reduced volume with increasing date palm fruit pulp could be as a result of minimal hydration of 50%, having used 275 ml of water for 500 g of flour to form a dough.

Sensory evaluation of bread samples

The results of the comparative sensory evaluation of the different substitution of sucrose with date palm fruit pulp are indicated in Table 6.

There were no significant differences ($P < 0.05$) between the loaf samples in taste, texture, aroma, crumb colour, crust colour and general acceptability.

Conclusion

This study has shown that bread can be produced adequately using date palm fruit pulp with variations in the sucrose levels. The proximate

Nutrients%	$S^{100}/_{0}$	$S^{75}/_{25}$	$S^{50}/_{50}$	$S^{25}/_{75}$	$S^{0}/_{100}$	LSD
Carbohydrate	45.39±0.29^{a}	43.53±0.42^{b}	39.10±0.16^{c}	36.74±0.13^{d}	35.13±0.12^{e}	1.03
Protein	15.19±0.10^{d}	16.3±0.10^{c}	18.08±0.10^{b}	19.07±0.18^{a}	19.3±0.18^{a}	0.37
Moisture	28.19±0.32^{b}	28.51±0.27^{ab}	28.79±0.23^{ab} 28	.87±0.03^{a}	28.92±0.09^{a}	0.655
Ash	2.44±0.02^{d}	2.61±0.02^{d}	3.17±0.01^{c}	3.51±0.04^{b}	4.11±0.15^{a}	0.20
Crude fibre	1.65±0.02^{e}	1.99±0.10^{d}	3.32±0.06^{c}	4.09±0.13^{b}	4.43±0.04^{a}	0.22
Fat	6.34±0.06^{d}	7.02±0.09^{c}	7.53±0.12^{b}	7.71±0.03^{b}	7.98±0.05^{a}	0.24

* Mean values in the same row with the same superscript are not significantly different at P < 0.05
The means were separated using least significant.
$S^{100}/_{0}$ = Bread with 100% sucrose
$S^{75}/_{25}$ = Bread the sucrose was substituted with 25% date palm fruit pulp
$S^{50}/_{50}$ = Bread the sucrose was substituted with 50% date palm fruit pulp
$S^{25}/_{75}$ = Bread the sucrose was substituted with 75% date palm fruit pulp
$S^{0}/_{100}$ = Bread the sucrose was completely replace with date palm fruit pulp.

Table 4: Mean values for the proximate composition of bread as affected by different substitution of sucrose with date palm (phoenix dactylifera) fruit pulp.

Bread samples	Specific volume (cm^3/g)	Loaf volume (cm^3)
$S^{100}/_{0}$	3.12^{a}	1920.3
$S^{75}/_{25}$	2.08^{ab}	1923
$S^{50}/_{50}$	3.06^{ab}	1925.3
$S^{25}/_{75}$	3.02^{ab}	1922.2
$S^{0}/_{100}$	2.93^{b}	1920.1
LSD	0.16	-

* Mean values in the same row with the same superscript are not significantly different at P < 0.05
The means were separated using least significant
$S^{100}/_{0}$ = Bread with 100% sucrose
$S^{75}/_{25}$ = Bread the sucrose was substituted with 25% date palm fruit pulp
$S^{50}/_{50}$ = Bread the sucrose was substituted with 50% date palm fruit pulp
$S^{25}/_{75}$ = Bread the sucrose was substituted with 75% date palm fruit pulp
$S^{0}/_{100}$ = Bread the sucrose was completely replace with date palm fruit pulp.

Table 5: Mean values of the specific volume and loaf volume of different substitution of sucrose with date palm *(phoenix dactylifera)* fruit pulp on quality of bread.

Bread samples %	Taste	Texture	Aroma	Crumb colour	Crust colour	General Acceptability
$S^{100}/_{0}$	8.04	7.96	7.28	6.8	6.52	8.24
$S^{75}/_{25}$	7.89	7.91	7.18	6.72	6.28	7.92
$S^{50}/_{50}$	7.8	7.82	7.12	6.64	5.96	7.75
$S^{25}/_{75}$	7.55	7.77	7.02	6.58	5.32	7.58
$S^{0}/_{100}$	7.24	7.68	7.04	6.4	5.56	7.44
LSD	-	-	-	-	-	-

* Mean values in the same column are not significantly different at P < 0.05
$S^{100}/_{0}$ = Bread with 100% sucrose
$S^{75}/_{25}$ = Bread the sucrose was substituted with 25% date palm fruit pulp
$S^{50}/_{50}$ = Bread the sucrose was substituted with 50% date palm fruit pulp
$S^{25}/_{75}$ = Bread the sucrose was substituted with 75% date palm fruit pulp
$S^{0}/_{100}$ = Bread the sucrose was completely replace with date palm fruit pulp.

Table 6: Mean values of the sensory evaluation of bread as affected by substitution of sucrose with date palm *(phoenix dactylifera)* fruit pulp.

analysis indicated that the nutritional value of the bread increased as the date palm fruit pulp level increased.

Recommendation

Author thereby suggest public enlightenment on the nutritional importance of date palm fruit and also recommend that sucrose can be substituted with date palm fruit.

References

1. Mannay S, Shadaksharawary CM (2005) Facts and principles. New Age International Ltd. Publishers.
2. Shittu TX, Raji AO, Sani LO (2007) Bread from composite cassava-wheat flour: I. Effect of baking time and temperature on some physical properties of bread loaf, food research International 40: 280-290.
3. Bali PS (2009) Bread fabrication. In: Food production operations. Oxford University Press, USA.
4. Gusba J (2008) Sugar, sugar!:A look at the functional role sugar in baking.
5. Campbell AM, Penfield MP, Gris world RM (1979) Yeast breads and Quick breads. In: The experimental study of foods. Houghton Mifflir Company, Boston.
6. Al-Shahib W, Marshall RJ (2003) The fruit of date palm: its possible use as best food for the future. Internal Journal of Food Science and Nutrition 54: 247-259.
7. Al-Hooti S, Jiuan S, Quabazard H (1995) Studies on the physics-chemical characteristics of date fruits of fine UAEA cultivars at different stages of maturity. Arab gulf J 13: 553-569.
8. El-hadrami I, El-Hadrami A (2009) Breeding date palm. In: Jani SM, Priyadarshan PM. Breeding plantation Tree crops, Springer, New York, USA.
9. Jain SM, Al-Khayi JM, Johnson DV (2011) Date Palm Biotechnology. Springer, USA.
10. El- hadrami A, Daayf F, El- Hadrami I (2011) Date palm genetics and breeding. In: Jani SM, Al – Khayi JM and Johnson DV. Date Palm Biotechnology, Springer Netherlands, USA.

11. Al- Hooti S, Sidu JS, Quabazard H (1995) Studies on the physics-chemical characteristics of date fruits of fine UAEA cultivars at different stages of maturity. Plant food for human nutrition 50: 101-113.

12. Omamor IB, Aisagbonli CI, Oruade Dimain EA (2000) Present status of Date palm diseases, Disorders and pests in Nigeria. Proceedings of the date palm international symposium, NnidHoek, Namibia.

13. Abdul-Qadir IM, Garba ID, Esiegbe E, Omofonmwan EI (2011) Nutritional components of date palm and its production states in Nigeria. International Journal of Agricultural Economics and Rural Development 4: 83-89.

14. Glasner B, Botes A, Zaid A, Emmens J (2002) Date harvesting, parking house management and marketing aspects. In: The Encyclopedia of fruits and Nuts Jawick J and Pall ER Cambridge University Press, Cambridge, USA.

15. El- hadrami A, Al Khayri JM (2012) Socio-economic and traditional importance of date palm. Emirates Journal of food and Agriculture.

16. Elleuch M, Berbes S, Rosiseux O, Blecker C, Deroame C, et al. (2008) Date flesh: chemical compositions and characteristics of the dietary fibre. Food chem 111: 676-682.

17. Cauvain S (1998) Technology of bread-making. In.Cauvain SP and young LS. Food Science and Nutrition.

18. Isserilykska D, Karadjor G, Agelor A (2001) Mineral composition of Bulgarian wheat bread European Food Research and Technology 213: 244-245.

19. Serrem CA, Kock HLD, Taylor JRN (2011) Nutritional quality, sensory quality and consumer acceptability of Sorghum and bread wheat biscuits fortified with defatted soy flour. International Journal of food science and Technology 46:74-83.

20. Ukpabi A (2008) Cassava processing utilization. NRCRI, Umuahia, Nigeria.

21. Cauvain SP, Young LS (2008) Bakery Food Manufacture and Quality: Water Control and Effects,(2ndedn). Blackwell science, oxford,l USA.

22. William T, Pullen G (1998) Functional ingredients.In. Cauvain S.P and young LS (eds.) Technology in bread-making. Blackie Academics and Professional, New York.

23. Kent NL, Evers AD (1994) Kent's Technology of Cereals: An Introduction of Students of food science and agriculture. Elsener science, Oxford, USA.

24. Hoseney RC (1998) Principles of cereal Science and Technology. American Association of cereal chemists, Inc. Miniesota, USA.

25. Stauffer CE (1998) Principles of dough formation. In: Cauvain SP and Young LS. Technology in bread-making. Blackie Academic and Professional, New York, USA.

26. Salhlstrum S, Park W, Shelton DR (2004) Factors influencing yeast formation and effect LMW sugars and yeast fermentation on health bread quality. Cereal chem 81: 328-335.

27. Okaka JC, Ikegwu F (2011) Dietary fiber and encouraging the use of monogastric nutrition. Journal of Science and Techn.

28. Anon (2010) Natural sugar substitute: 10 healthier alternatives to refined sugar.

29. Phillips S (2010) Dry sweeteners.

30. Khan F (2010) Natural ingredient you can use to replace sugar. Demand Media Inc.

31. Anon (1998) Substitute Natural and Artificial sweeteners.

32. Demiralp H, Celik S, Koksel H (2000) Effect of oxidizing agents and defatting on the electrophoretic patterns of flour proteins during dough mixing. Eur Food Res Technol 211: 322-235.

33. Dendy DAV, Dobrasczyk BJ(2001) Cereals and Cereal Products: Chemistry and technology. Food science and nutrition, Springers Book Archives, USA.

34. Atwell WA (2007) wheat flour. Fagan Press handbook series, Minnesota, USA.

35. Salbni SS, Baik OD, Marcotte M (2012) Neural network for predicting thermal conductivity of bakery products. J Food Eng 52: 299-304.

36. Lean ME (2006) Fox and Cameron's food science, nutrition and health. Nutrition in health and disease, CRC press, Taylor and Francis Group, USA.

37. AOAC (2010) Official methods of analysis. (18thedn). Association of official analytical chemists.

38. AACC (2000) Approved methods of American association of cereal chemists. (10thedn). AACC International.

39. James CS (1995) The adverse effects of long term cassava (Manihotesculenta Ganta).

40. Chang (2003) Protein analysis in food analysis. Klewer Academic or plenium Publishers, New York.

41. Min DB, Boff JM (2008) Crude fat analysis. In: Neilson SS. Food Analysis. Kluwer Academic/Plenium Publishers, New York, USA.

42. Annette-Cannetar BA (2013) Department of food science and technology. Rutgers University, Newyork,USA.

43. Steel RG, Torrie JH, Dickey DA (1996) Principles and procedures of statistics. A Biometric Approach. MC Graw-Hill companies.

44. Sadiq IS, Izugaize T, Shuaibu M, Dogoyaro AI, Garba A, et al. (2013) The Nutritional Evaluation and Medicinal Value of Date Palm *(Phoenix dactylifera).* International Journal of Modern Chemistry 4: 147-154.

45. Obiegbuna JE, Akubor PI, Ishiwu CN, Ndife J (2013) Effect of substituting sugar with date palm pulp meal on the physiochemical, organoleptic and storage properties of bread. African Journal of Food Science 7: 113-117.