

## PHYTOCHEMICAL COMPOSITION AND SENSORY PROPERTIES OF PEANUT BAR (Kulikuli) PRODUCED WITH DATE POWDER AS SUGAR SUBSTITUTE

Ojo, M.O<sup>1</sup>, Yusufu, P. A<sup>2</sup>, Balogun, A.A<sup>3</sup>, Zubair, A.B.<sup>1</sup>, Ogunbande, B.A<sup>4</sup>, and Emmanuel- Wadal, J.H<sup>1</sup>

<sup>1</sup>Federal University of Technology Minna, Department of Food Science and Technology

<sup>2</sup>Kogi State University Anyigba, Department of Food, Nutrition and Home Science

<sup>3</sup>Joseph Tarka Suswam University Makurdi, Department of Food Science and Technology

<sup>4</sup>Federal University Oye Ekiti, Department of Food Science and Technology

Author for correspondence: ojo@futminna.edu.ng

### ABSTRACT

The study investigated the phytochemical composition and sensory properties of peanut bar (*kulikuli*) using date pulp powder as a sugar substitute in a bid to reduce sugar consumption and increase the health of the populace as peanut bar (*kulikuli*) is a widely consumed snacks in Nigeria. The peanut bars (*kulikuli*) were produced and the phytochemical and sensory characteristics determined using standard methods. The sugar and date powder used were blended in the ratios of 20:0 (K0), 16:4 (K1), 12:8 (K2), 8:12 (K3), 4:16 (K4), and 0:20 (K5). An increase in the phytochemical composition was observed with the substitution of dates pulp powder in a dose dependent manner in the peanut bar samples. The sensory evaluation results indicated that peanut bars (*kulikuli*) with acceptable preference could be supplemented up to 100% dates pulp powder. However, the most acceptable was the sample K4. Partial or full replacement of sugar in peanut bar could be produced as functional food products for improved nutrition for the populace and at a commercial scale.

**Keywords:** Peanut bar, Sugar, Dates pulp powder, Phytochemicals, Acceptability

### 1.0 INTRODUCTION

Peanut cake (*kuli-kuli*) is a well-known snack majorly produced from groundnut in Nigeria. It is consumed by most Nigerians especially in the North, enjoyed by people of all ages, but particularly by youth and the middle-aged (Achimugwand Okolo, 2020). The main ingredient in *kulikuli* production is groundnut paste and sweetener other ingredient such ginger, pepper could be added as desired and deep-fried in oil. The groundnut paste is obtained as the leftover after the extraction of oil in groundnuts. Salt is sometimes used instead of sugar but the most consumed regularly especially by the people of low income is the sugar sweetened peanut bars. Although sugar is vital for proper physiological functions of the body, World Health Organization recommends limiting added sugar intake to less than 10% of their total daily calories as increased intake of added sugar might increase the risks for obesity, cardiovascular diseases, dental caries, glucose intolerance, diabetes mellitus, hypertension and behavioral complications such as hyperactivity in women and more in children as "sweet tooth" or "craving for sugar" becomes part of life ((WHO, 2015).

Utilization of fruits in food preparation requiring sweet taste has been recommended in order to reduce the added sugar intake and dates palm fruit (*Phoenix dactylifera L*) have singled out its unique use as an ideal fruit to substitute added sugar in foods, and they play an important role in daily nutrition of many people in Nigeria. Date palm fruit (*Phoenix dactylifera L*) locally called *debino* in

Hausa language (Dada *et al.*, 2012). Date has been used in several forms such as juice, syrups, and spreads. They are sweet fruits that contain more than 70% sugar, i.e. fructose, and thus can be regarded as high energy fruit that can be a good replacement for sugar (sucrose) in foods. Date pulp contains dietary fibers, antioxidant and flavonoids (Manickavasagan *et al.*, 2013; Dada *et al.*, 2012). In view of these attributes, the use of date palm fruit as substitute for sugar in *kulikuli* will not only be an ideal snacks food contributing to the reduction of sugar intake in especially children which will promote good health, but will also serve as a good functional food while meeting up with the rising customer preferences for low-calorie food and at the same time wider increase utilization of date resulting in more income for the farmers and wastes reduction as they are perishable and delicate because of their high moisture content of 28-32%.

## 2.0 MATERIALS AND METHODS

### 2.1 Source of materials

Groundnuts seeds (3 kg), date palm fruits (3 kg dried fruits), ginger, pepper and salt were purchased from Kure ultra-modern market, Minna, Niger state, Nigeria. All laboratory materials and reagents used were of analytical grade. The raw materials were sorted and properly cleaned by removing extraneous matter prior to their use.

### 2.2 Production of date palm powder

The production of date pulp powder was carried out using the method described by Agbugbaet *al.* (2015) with slight modification. To obtain the date palm powder, the date fruit palm was washed with distilled water, deseeded, cut into pieces and dried at 50°C for 48 hours. The dry date pulp was milled and sieved using a 500 µm sieve to obtain the date powder. This was packaged in a ziplock bag for further analysis.

### 2.3 Production of peanut bar (*kulikuli*)

The groundnut seeds were roasted followed by grinding to produce paste. *Kulikuli* ingredient was formulated using 250g of the groundnut paste, 8g pepper, 10.5g of ginger powder and 9g of salt. 80ml of water and 20 g of sweetener were mixed together thoroughly. This was further pressed, molded, fried and cooled (Achimugu and Okolo, 2020). This was then packaged in a ziplock bag. The sweetener used was in the ratio of sugar: date powder 20g:0g (K0), 16g:4g (K1), 12g:8g (K2), 8g:12g (K3), 4g:16g (K4), and 0g:20g (K5).

### 2.4 Analyses of samples

The tannins and saponins content were determined following the method described by Kauret *al.* (2015). The phenolic and flavonoid content were determined using the method adopted by Arinola *et al.* (2022). Twenty (20) member panelists who were familiar with the product were used for the sensory evaluation on 9-point Hedonic scale (IFT 1981). One-Way Analysis of Variance (ANOVA) and Duncan Multiple Range Test at 5% level of significance were performed using SPSS software version 20 to evaluate differences in data obtained.

## 3.0 Results and Discussions

### 3.1 Phytochemical composition of the peanut bars

The tannins, saponins, phenol and flavonoid contents of the examined date substituted peanut bar (*kulikuli*) is as presented in Table 1. The various date substituted peanut bar produced showed significant differences in the phytochemical composition. The tannin and saponins contents ranged between 20.64 (K0, K1) to 24.50 mg/100g (K5) and 23.73 (K0) to 29.13 mg/100g (K4) respectively. While the phenol and flavonoids contents ranged between 190.88 mg/100g (K0) to 194.60 mg/100g (K5) and 48.21 mg/100g (K0) to 52.62 mg/100g (K5) respectively. Generally, the phytochemical content increased with increase in date substitution. Previous studies had established date as a good source of phytochemicals (Dada *et al*, 2012) and this was observed in the higher values recorded than in the control samples. There are growing interests in food with phytochemicals that when consumed in adequate amount confers health benefits. They act as antioxidants that scavenge harmful reactive oxygen species (ROS) or free radicals over-produced in the cells under oxidative stress conditions leading to lower risk of degenerative diseases (Sakihama and Yamasaki, 2021). The functional potentials of these phytochemicals could increase the health of an individual

### 3.2 Sensory characteristics of the peanut bars

The sensory properties of the peanut bars are as shown in Table 2. All the peanut bars were acceptable as the mean sensory scores were above 7.10 (like moderately) for all the parameters measured at the 9-point hedonic scale. Darker appearance was observed for the date pulp powder substituted peanut bar, this could be due to the inherent colour of the date powder in addition to the caramelization process during frying. Sample K4 (4g table sugar: 16g date pulp powder) had the most acceptable rating of 8.05 (like very much) while K0 (control) had the highest rating for appearance (8.50) and crispiness (8.15). Higher aroma ratings was observed with higher substitution of date (K4 and K5), probably due to the flavonoids which may contribute to the aroma, this was also reported by Shehu *et al.* (2022) on cake produced by replacing sugar with dates syrup. Crispiness has been closely related to moisture content, the low crispiness rating for partial and total replacement of sugar with date could be due to the high fructose concentration in dates which are hygroscopic in nature. There was no significant ( $p < 0.05$ ) difference in acceptability between sample K1 and K5 and could possibly imply that sugar can be replaced with date in peanut bar production with the acceptability unaffected.

**Table 1. Phytochemical composition of peanut bars (*kulikuli*) produced by substituting sugar with date powder**

Sample	Parameters (mg/100 g)			Flavonoids
	Tannin	Saponin	Phenol	
K0	20.64 <sup>c</sup> ± 0.39	24.80 <sup>c</sup> ± 0.05	190.88 <sup>c</sup> ± 0.37	48.21 <sup>cd</sup> ± 0.79
K1	21.10 <sup>c</sup> ± 0.17	23.73 <sup>d</sup> ± 0.06	194.24 <sup>a</sup> ± 0.33	48.30 <sup>cd</sup> ± 0.51
K2	23.60 <sup>b</sup> ± 0.26	24.64 <sup>c</sup> ± 0.49	194.67 <sup>a</sup> ± 0.47	48.80 <sup>c</sup> ± 0.18
K3	23.43 <sup>b</sup> ± 0.40	24.30 <sup>c</sup> ± 0.64	193.88 <sup>b</sup> ± 0.02	49.61 <sup>b</sup> ± 0.53
K4	24.50 <sup>a</sup> ± 0.40	25.71 <sup>b</sup> ± 0.14	194.50 <sup>ab</sup> ± 1.24	49.70 <sup>b</sup> ± 0.11
K5	24.50 <sup>a</sup> ± 0.50	29.13 <sup>a</sup> ± 0.58	194.60 <sup>a</sup> ± 0.43	52.62 <sup>a</sup> ± 0.76

Values are means  $\pm$ SD. Columns with different superscript shows a significant difference  
 K0=20g table sugar: 0g date pulp powder, K1=16g table sugar: 4g date pulp powder, K2=12g table sugar: 8g date pulp powder, K3=8g table sugar :12g date pulp powder, K4=4g table sugar: 16g date pulp powder, K5=0g table sugar: 20 g date pulp powder

**Table 2. Mean sensory scores for peanut bars produced by substituting sugar with date powder**

Sensory Parameters					
Sample	Appearance	Taste	Aroma	Crispiness	Overall acceptability
K0	8.50 <sup>a</sup> $\pm$ 0.23	7.80 <sup>b</sup> $\pm$ 0.19	7.70 <sup>b</sup> $\pm$ 0.18	8.15 <sup>a</sup> $\pm$ 0.28	7.80 <sup>ab</sup> $\pm$ 0.18
K1	8.15 <sup>b</sup> $\pm$ 0.15	7.90 <sup>b</sup> $\pm$ 0.18	7.70 <sup>b</sup> $\pm$ 0.20	8.10 <sup>a</sup> $\pm$ 0.18	7.50 <sup>c</sup> $\pm$ 0.29
K2	7.80 <sup>cd</sup> $\pm$ 0.28	7.95 <sup>c</sup> $\pm$ 0.27	7.55 <sup>c</sup> $\pm$ 0.22	7.80 <sup>b</sup> $\pm$ 0.19	7.10 <sup>d</sup> $\pm$ 0.23
K3	7.95 <sup>c</sup> $\pm$ 0.10	7.45 <sup>d</sup> $\pm$ 0.21	7.50 <sup>c</sup> $\pm$ 0.16	7.70 <sup>b</sup> $\pm$ 0.22	7.65 <sup>c</sup> $\pm$ 0.18
K4	7.95 <sup>c</sup> $\pm$ 0.20a\	8.25 <sup>a</sup> $\pm$ 0.04	8.15 <sup>a</sup> $\pm$ 0.20	7.70 <sup>b</sup> $\pm$ 0.19	8.05 <sup>a</sup> $\pm$ 0.17
K5	7.90 <sup>c</sup> $\pm$ 0.20	7.81 <sup>b</sup> $\pm$ 0.20	8.10 <sup>a</sup> $\pm$ 0.17	7.40 <sup>bc</sup> $\pm$ 0.22	7.80 <sup>ab</sup> $\pm$ 0.20

Values are means  $\pm$ SD. Columns with different superscript shows a significant difference  
 K0=20g table sugar: 0g date pulp powder, K1=16g table sugar : 4g date pulp powder, K2=12g table sugar: 8g date pulp powder, K3=8g table sugar :12g date pulp powder, K4=4g table sugar: 16g date pulp powder, K5=0g table sugar: 20 g date pulp powder

#### 4.0 Conclusion

This study revealed that acceptable peanut bar (*kulikuli*) could be successfully formulated using date powder as a partial or full replacement for sugar. The use of date in substituting sugar in peanut bar had comparable sensorial ratings with the un-substituted peanut bar. The peanut bar with 80 % date pulp powder substitution was the most preferred. The phytochemical properties of the peanut bars prepared using date powder were affected by demonstrating an increase in saponins, tannin, phenolic and flavonoids content when compared with the 100 % sugar sweetened peanut bars. Though, substitution of sugar with date pulp powder gave peanut bars (*kulikuli*) with a darker appearance and low crispy characteristics. Sensory evaluation also indicated that date powder could replace up to 100 % with acceptable sensory characteristics. Hence, the results obtained in this study indicate the possibility of utilizing date powder to develop acceptable peanut bars. More study is recommended on the packaging and shelf life of these products

REFERENCES

- Achimugu, O and Okolo, J.C. (2020). Evaluation of the nutritional quality of kuli-kuli (peanut cake) produced from melon seeds and groundnut. *Indonesia Food Science and Technology Journal*, 4(1), 15-18. <https://doi.org/10.22437/ifstj.v4i1.10725>.
- Agbugba, I. K. Onoja, U. S., and Achimugu, E. (2015). Nutritional composition and phytochemical screening of dates (*Phoenix dactylifera* L.) fruit pulp. *American Journal of Food Science and Technology*, 3(6), 176-179.
- Arinola, S.O., Akingbala, J.O. and Omowaye-Taiwo, O. A. (2022). Breadfruit-bambara groundnut dumpling Dough: Its phenolic and flavonoid contents, antioxidants activities and effect on starch hydrolyzing enzymes. *Nigerian Food Journal*, 40(1), 28-38.
- Dada, S. O., Suru, S. M. and Akinyele, I. O. (2012). Nutritional composition of selected edible nuts consumed in Nigeria. *Pakistan Journal of Nutrition*, 11(4), 335-338.
- IFT (1981). Institute of technologists. Sensory evaluation of food and beverage products. *Journal of Food Science* 35(11), 50-59.
- Kaur, R., Arora, S. and Thukral, A. K. (2015). Quantitative and qualitative analysis of saponins in different plant parts of *Chlorophytum borivialum*. *International Journal of Pharmaceutical Biological Science*, 6(1), 826– 835.
- Manickavasagan, A., Mathew, T. A., Al-Attabi Z. H. and Al-Zakwani M. (2013). Dates as a substitute for added sugar in traditional foods – A case study with idli. *Emirate Journal Food Agriculture*, 25 (11), 899-906.
- Sakihama, Y. and Yamasaki, H. (2021). Phytochemical Antioxidants: Past, Present and Future. *IntechOpen*. doi: 10.5772/intechopen.95627
- Shehu, A.A. Balogun, D.O., Kolo, S.I., Jubril, B., Ayuba A. and Bashir K.M. (2022). Quality evaluation of date syrup sweetener and its performance in toasted cake. *Nigerian Food Journal* 40(1), 1-9.
- World Health Organization (2015). World health report. ISBN 978 92 4 154902 8 (NLM classification: QU 145.7).