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Physicochemical and Nutritional Assessment of Cake from Wheat (Triticum aestivum) and Peanut (Arachis hypogaea) Flour Blends Using Date Powder (Phoenix dactylifera) as A Natural Sweetener

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ABSTRACT

This study investigated the physicochemical and nutritional assessment of cakes produced from wheat (Triticum aestivum) and peanut (Arachis hypogaea) flour blends using date powder (Phoenix dactylifera) as a natural sweetener. The blending ratios (Wheat and Peanut flours) used for the study were 100:0 (WF as control), 85:15 (WF: PF), 70:30 (WF: PF), 55:45 (WF: PF) which were sample (A, B, C and D) respectively. The result showed that 70:30 (WF: PF) blends (sample C) that has a good balance nutritional and sensory properties with a relatively high protein content value (10.50 %), moderate glycemic index value (30.00 %) and acceptable sensory value of (6.75 %). The use of date powder reduced the sugar content, improved the nutritional profile of the cakes. The study indicated that cake of high nutritional quality could be produced from composite flour blends of wheat and peanut, offering a nutritious, flavourful, and versatile snack option.

Keywords

Cake, Date-powder, Flour, Peanut, Physiochemical and Wheat.

Introduction

The global food industry has witnessed significant transformations over the years, with increasing emphasis on the nutritional value and health benefits of food products [1]. The bakery sector, particularly cake production, has evolved to accommodate consumer preferences for healthier alternatives without compromising taste and texture [2]. Cake is a widely consumed bakery product, traditionally from refined wheat flour, sugar, and fats, which contribute to their high glycemic index [3]. The high glycemic index of refined wheat flour-based cake has been associated with rapid spikes in blood sugar levels, leading to concerns over their long-term health impacts, including obesity and diabetes [1]. In response to these concerns, recent research has focused on modifying cake formulations by incorporating alternative flour sources and natural sweeteners to enhance their nutritional profile while maintaining desirable sensory properties [2]. Wheat (*Triticum aestivum*) remains the most common flour used in cake production due to its gluten-forming ability, which provides the characteristic structure and texture of cake [2].

However, the incorporation of other nutrient-dense flours, such as peanut (*Arachis hypogaea*) flour, has been explored to improve the protein and lipid content of cake [1]. Peanut are rich in proteins, healthy fats, and bioactive compounds, which contribute to the nutritional quality of composite flour blends [3]. Dates (*Phoenix dactylifera*) have been recognized as a natural sweetener due to their high fibre, polyphenol, and essential mineral content, making them a suitable replacement for refined sugar in cake formulations [4]. The integration of dates into composite flour cake offers the advantage of reducing the glycemic index, while enhancing antioxidant properties [3]. The combination of wheat and peanut flours blend along with dates as a natural sweetener, presents an opportunity to develop more nutritious cake with improved functional properties as wheat flour provides the necessary gluten structure for cake formation, peanut flour enhances the protein

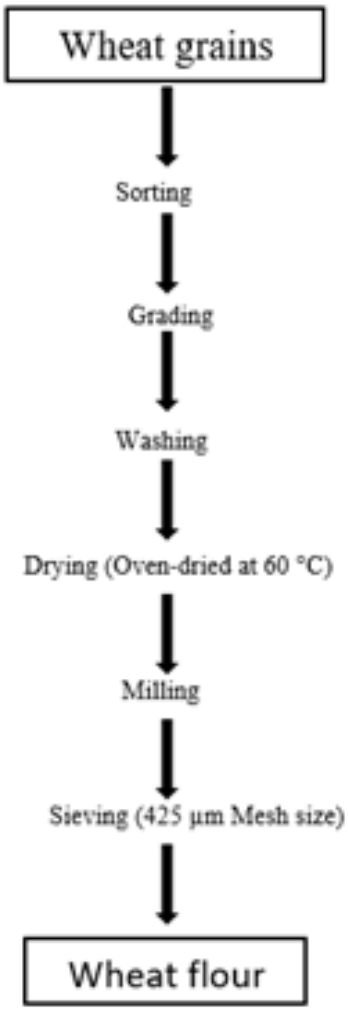
and lipid content and dates contribute natural sweetness [2]. The incorporation of peanut flour into wheat-based cake improves the amino acid profile and lipid composition, while the addition of dates as a natural sweetener reduces the dependence on refined sugars and enhances bioactive compound availability [1].

Materials and Methods

The raw materials for this study were Wheat (*Triticum aestivum*), Peanut (*Arachis hypogaea*) and Dates fruits (*Phoenix dactylifera*). They were purchased from Anua Market, Uyo Local Government Area, Akwa-Ibom State, Nigeria.

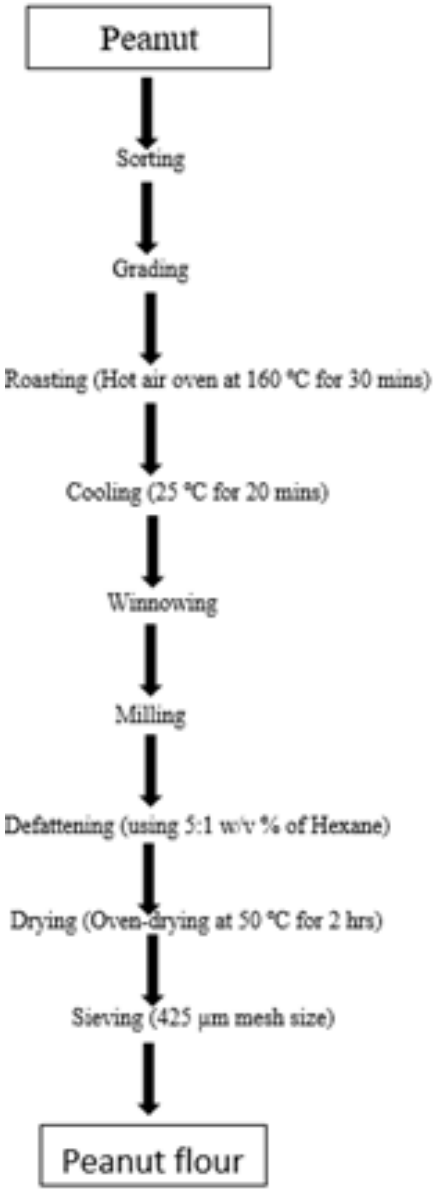
The method of obtaining the wheat flour to produce the cake involved sorting the grains, washing, drying, milling and sieving. The peanut flour was obtained by sorting, grading, roasting, cooling, winnowing, milling, defattening with 5:1 w/v % of hexane, drying and sieving. Then, to obtain the fine date powder, it involved sorting, grading, washing, deseeding, washing, drying, milling, and sieving.

Figure 1



To produce the cake, composite flour blends (wheat and peanut) were obtained, mixing of dry ingredients, adding of wet ingredients (eggs, butter, milk, vanilla extract), proofing of the cake mixture, greasing the pan, transferring the mixture into the greased pan, baking and cooling.

Figure 2



Results and Discussion

Table 1: Functional Properties of Cake from Wheat and Peanut flour blends.

Sample	BD (g/ml)	WAC (g/ml)	OAC (g/ml)	FC (%)	SC (%)
A	$0.25^{a}\pm0.01$	$60.00^{d}\pm1.41$	$47.50^{b}\pm4.95$	$10.00^{c}\pm1.41$	$60.00^{a}\pm1.41$
B	$0.26^{a}\pm0.03$	$65.00^{c}\pm1.41$	$55.00^{ab}\pm1.41$	$12.50^{bc}\pm0.14$	$57.50^{a}\pm0.14$
C	$0.25^{a}\pm0.01$	$70.00^{b}\pm1.41$	$60.00^{a}\pm1.41$	$15.00^{ab}\pm0.71$	$52.50^{b}\pm0.28$
D	$0.29^{a}\pm0.01$	$75.00^{a}\pm1.41$	$65.00^{a}\pm1.41$	$17.50^{a}\pm0.71$	$50.00^{b}\pm1.41$

Values are means ± standard deviation of the triplicate determinations. Means with different superscript in the same column are significantly ($p<0.05$) different.

Figure 3

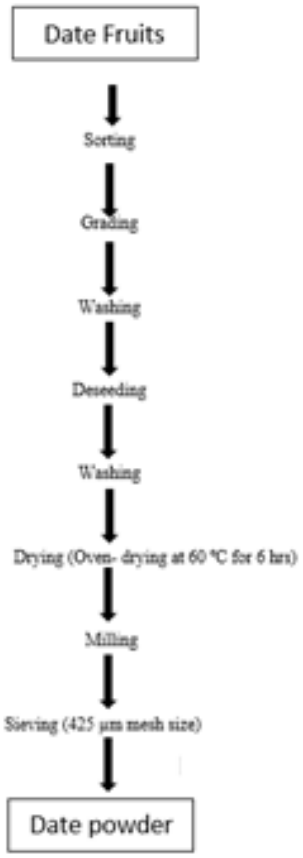
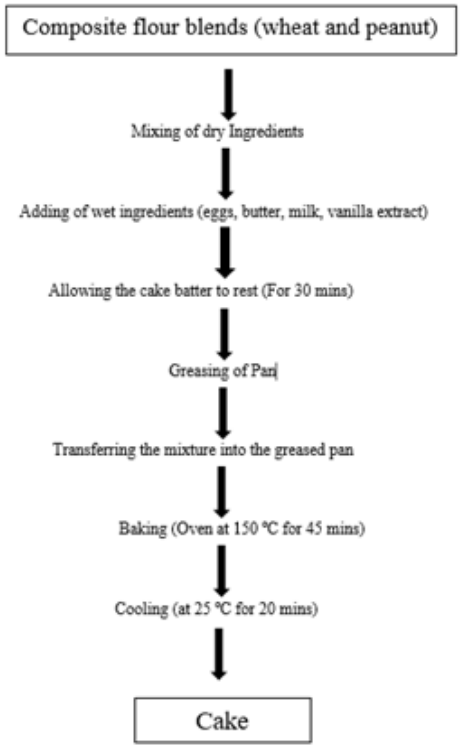


Figure 4



The results showed that bulk density of the flour blends ranged from 0.25 g/ml in samples A (Control sample) and C to 0.29 g/ml in sample D. There was no significant difference ($p>0.05$) in the bulk density (BD) of the flour blends. Water absorption capacity (WAC) of the flour blends ranged between 60.00 g/ml and 75.00 g/ml, with sample A (Control sample) (60.00 g/ml) having the lowest water absorption capacity level while Sample D (75.00 g/ml) had the highest water absorption capacity level. Water absorption capacity of the flour blends varied significantly ($p<0.05$) from one another. Oil absorption capacity (OAC) of the flour blends ranged between 47.50 g/ml and 65.00 g/ml, with sample D (65.00 g/ml) having the highest oil absorption capacity while sample A (Control sample) (47.50 g/ml), had the lowest oil absorption. There was a significant difference ($p<0.05$) in the oil absorption capacity of the flour blends. Foaming capacity (FC) of the flour blends ranged between 10.00 % and 17.50 %, with sample A (Control sample) (10.00 %) having the lowest foaming capacity level while sample D (17.50 %) having the highest foaming capacity level. There was a significant difference ($p<0.05$) in the foaming capacity of the flour blends. Swelling capacity (SC) of the flour blends ranged between 50.00 % and 60.00 %, with sample D (50.00 %) having the lowest swelling capacity level, while sample A (Control sample) (60.00 %) had the highest swelling capacity level. There was a significant difference ($p<0.05$) in the swelling capacity of the samples.

Conclusion

This study effectively evaluated the physicochemical and nutritional assessment of cake formulated with wheat and peanut flour blends using date powder as a natural sweetener. The natural sweetness of date powder reduces the need for artificial sweetener, while peanut flour contributes to the cake's protein and fibre content. The results demonstrate the incorporation of peanut and date powder enhances the nutritional profile of the cake, providing healthy fats, dietary fibre, antioxidants and essential minerals. Overall, this research highlights the potential of cake from wheat and peanut sweetened with date powder as a healthier alternative from consumers, offering improved nutritional benefits and health advantages.

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