

## NUTRIENT COMPOSITION OF FERMENTED MILK PRODUCTS SOLD IN OWERRI METROPOLIS, IMO STATE.

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### Abstract

Fermented dairy products are known to contain bioactive compounds and probiotics which offer beneficial health effects on humans. The study was conducted to determine the nutritional composition of some yoghurts types sold in Owerri Metropolis, Imo state. Three (3) samples each of traditional yoghurt; kindirmo (labelled K) obtained from Hausa vendors and six (6) brands of commercial yoghurts in bottles (labelled YA-YF) purchased from different shops and supermarkets were evaluated for moisture content (MC), total solids (TS), fat content, protein content, ash content, Brix value (%), calcium (Ca) and phosphorus (P) contents. The results obtained revealed that MC ranged from 74.57 to 94.45%, TS ranged from 5.05 to 25.43%, protein content ranged from 1.19 to 3.66% while fat content ranged from 1.08 to 4.90%. Three brands of commercial yoghurt had high moisture contents ( $\geq 90\%$ ) which were higher than the standard value ( $< 84\%$ ) for good quality yoghurts. The highest mean value for TS (18.10%), Brix (12.50%) and ash contents (1.24%) were obtained from yoghurt brand YF ( $P < 0.05$ ). The protein contents of the commercial yoghurts were less than 3.00% except one brand (YD) which had similar protein content with K (3.27%). K had higher fat content (4.93%) and lower Brix value (1.67%) than the commercial yoghurt brands ( $P < 0.05$ ). Eventhough YE had the highest mean value for Ca content (895mg/L), the mean values obtained in the study for Ca and P contents for all the samples were lower than WHO standards. It was concluded that producers of fermented milk products should improve the nutrient density of their products for the wellbeing of consumers.

**Keywords:** Nutrient composition, Traditional yoghurt, Commercial yoghurt brands

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### Introduction

Animal products such as milk, meat and eggs are known to play a vital role in the nutrition of humans. Milk as an animal product is highly nutritious and is utilized in the production of numerous fermented products all over the world (Okeke *et al.*, 2016). Presently, there is a growing interest in fermented dairy products due to the nutritional and health benefits offered by these products (Garcia-Burgos *et al.*, 2020). Fermented dairy products are known to provide calcium, phosphorus, fat, carbohydrates and proteins, all nutrients influencing various systems which include bone, cardiovascular system, central nervous system and intermediary metabolism (Rizzoli and Biver, 2024). They are good sources of probiotics, prebiotics and bioactive compounds and could also be used as nutraceutical agents and functional foods (Garcia-Burgos *et al.*, 2020). Health benefits of probiotics found in fermented milk include innate immune enhancement, diarrhea treatment, inflammatory bowel disease, diabetes, tuberculosis, relieving irritable bowel disease symptoms, obesity, preventing cancer, improving lactose tolerance, lowering cholesterol, enhancement of antioxidant activity and antimicrobial activity against pathogens (Saleem *et al.*, 2024).

Fermented milk products are numerous in variety and include different cheese types, kefir, yoghurt, sour cream, cultured butter milk, clabbered milk and cultured butter (Mitts, 2021). In Africa, a number of traditional fermented milk products are produced and consumed from one country to another (Mattiello *et al.*, 2017). Fermented milk products are widely consumed in Nigeria particularly in urban areas like Owerri, the capital city of Imo state. These products, such as commercial yoghurt and traditional yoghurt (kindirmo) come about by the action of lactic acid bacteria (LAB) to enhance their nutritional value and shelf life. Despite their nutritional benefits, there is need to evaluate the nutritional composition of these products sold in Owerri Metropolis, as the nutritional content may vary depending on factors such as type of milk used, fermentation method and storage conditions. Furthermore, the nutritional composition of these products may have implications for human health, particularly for vulnerable populations such as children and pregnant women.

### Materials and methods

#### Collection of fermented milk samples

Three (3) samples of traditional yoghurt (Kindirmo) were purchased from Hausa vendors and were collected in a sterile bottles. Also, three (3) samples each of six (6) brands of commercial yoghurts in bottles were purchased from shops and supermarkets in Owerri. They were labelled, placed in ice packed containers and taken to laboratory for analysis. The traditional yoghurt samples were labelled K while the commercial yoghurts were labelled YA to YF.

### Milk analysis

The samples obtained was analyzed for moisture content (MC), total solids (TS), fat content, crude protein, ash content, %Brix, calcium (Ca) and phosphorus (P) contents.

Proximate parameters were determined using the AOAC method. Moisture content (%MC) was determined by oven drying about 2.0 g of the sample at 105°C for 4-5 hours. Total solids were determined by gravimetric method: TS = 100 - %MC

Where; TS = Total solids and MC = moisture content

Protein, fat, and ash contents were determined by distillation method using Kjeldahl apparatus, Soxhlet extraction method and muffle furnace respectively. The Brix value (%) was determined using a hand refractometer while calcium (Ca) and phosphorus (P) contents were determined using EDTA titration method and spectrophotometric molybdenum blue method using a spectrophotometer (Model: 6405UV/Vis.by JENWAY), respectively.

### Statistical analysis

The data obtained was subjected to statistical analysis using Completely Randomized Design. Means were separated using Duncan's Multiple Range Test. SPSS software was used for the statistical analysis.

### Results and discussion

The moisture content (MC) of the fermented milk samples ranges from 74.57 to 94.45%; the MC of K ranged from 74.45 to 92.54% while the MC of commercial yoghurts ranged from 79.83 to 94.54%. The MC of K is similar to MC of 88.0-92.5% reported by Diko *et al* (2011) for kindirmo but higher than MC of 74.90-78.10% reported by Abubakar *et al.* (2023). The range of MC of commercial yoghurts (79.83 to 94.95%) differed from the report of Obasi *et al.* (2022) who recorded moisture content of 72.38 to 89.55% for commercial yoghurts in Taraba state. The TS obtained for the fermented milk samples ranged from 5.05-25.43%. The protein content ranged from 1.19-3.66%, the fat content ranged from 1.08 to 4.90% while the Brix value and ash content of the fermented milk samples ranged from 1.0 to 13.0% and 0.19 to 1.58% respectively.

Table 1 shows the mean values for nutrient composition of the traditional and commercial yogurts samples. The mean values for MC for commercial yoghurts brands YA and YC (94.80% and 93.48%) were significantly higher than other brands (P<0.05). This is higher than MC of less than 84% suggested for good quality yoghurts (Obasi *et al.*, 2022). The mean MC value of K and YE were similar (84.66% and 84.10% respectively) and were significantly higher than the mean MC of YF which had the least moisture content. The TS obtained for K in this study is higher than the values reported by Diko *et al.* (2011). The TS for commercial yoghurts also varied with the report of Matela *et al.* (2019) and Obasi *et al.* (2022). Yoghurt brand YA had the least mean TS (5.14%) while YF had the highest TS mean value (18.10%). The difference in TS observed among the milk samples could be as a result of the ingredients used in making the yoghurts. K and YD had the highest mean protein content (3.27%; P< 0.05) while YA had the least mean protein content (1.30%). The values of crude protein obtained in this study were lower than the values recorded for yoghurts produced from cow milk (27.97%) and goat milk (32.17%) by Ladodun and Oni (2014). Of all the fermented milk samples, K had the highest mean fat content (4.93%). However, this value contrasts the report of Abubakar *et al.* (2023) which showed higher values for fat content of kindirmo. The fat contents obtained in this study for commercial yoghurts is similar to the report of Omola *et al.* (2014). YA which had the least protein content also had the least fat content (1.15%). The low fat content obtained for commercial yoghurts in this study could also be attributed to the ingredients used in making the fermented milk products.

**Table 1: Mean values for nutrient composition of the fermented milk samples**

Parameter	Milk samples							SEM	P – Value
	K	YA	YB	YC	YD	YE	YF		
Moisture Content (%)	84.66 <sup>bc</sup>	94.86 <sup>a</sup>	90.02 <sup>ab</sup>	93.48 <sup>a</sup>	88.20 <sup>abc</sup>	84.10 <sup>bc</sup>	81.90 <sup>c</sup>	1.21	0.004
TS (%)	15.34 <sup>ab</sup>	5.14 <sup>c</sup>	9.99 <sup>bc</sup>	7.02 <sup>c</sup>	11.83 <sup>abc</sup>	15.90 <sup>ab</sup>	18.10 <sup>a</sup>	1.19	0.004
Protein (%)	3.27 <sup>a</sup>	1.30 <sup>c</sup>	1.61 <sup>c</sup>	2.74 <sup>ab</sup>	3.27 <sup>a</sup>	2.52 <sup>b</sup>	2.90 <sup>ab</sup>	0.17	0.000
Fat Content (%)	4.93 <sup>a</sup>	1.15 <sup>d</sup>	1.99 <sup>c</sup>	1.36 <sup>cd</sup>	2.88 <sup>b</sup>	1.86 <sup>c</sup>	2.78 <sup>b</sup>	0.27	0.000
Brix value (%)	1.67 <sup>e</sup>	4.00 <sup>d</sup>	6.00 <sup>c</sup>	6.00 <sup>c</sup>	7.80 <sup>b</sup>	8.00 <sup>b</sup>	12.50 <sup>a</sup>	0.71	0.000
Ash (%)	0.65 <sup>b</sup>	0.42 <sup>b</sup>	0.35 <sup>b</sup>	0.41 <sup>b</sup>	0.54 <sup>b</sup>	0.41 <sup>b</sup>	1.24 <sup>a</sup>	0.07	0.000

<sup>abc</sup> Means with different superscripts in the same row are significantly different (P<0.05); K = kindirmo (traditional yoghurt); YA – YF = commercial yoghurt brands; SEM = standard error of mean

The Brix and ash contents of yogurt sample YF (12.50% and 1.24% respectively) were significantly higher than other yoghurt samples ( $P < 0.05$ ). Brix is commonly used to measure the amount of dissolved sugar in an aqueous solution (Ferraïra de Paula *et al.*, 2020; Wikipedia, 2024). It has been observed that increase in %Brix of fermented milk products could result from increasing sweetness and overall solids content of the products (Ferraïra de Paula *et al.*, 2020). Hence, YF which had the highest TS also had the highest Brix value. The least mean Brix value (1.67%) was obtained from K. According to Diko *et al.* (2011), kindirmo is made without addition of flavours and sweeteners but sugar may be added during consumption. Hence, the low sugar content of K is expected.

The mean values for calcium (Ca) and phosphorus (P) contents of the fermented milk samples are shown in table 2. The Ca content of YE (895.00mg/L) was significantly higher ( $P < 0.05$ ) than other samples. However, the mean values obtained for Ca from all the samples were lower than the dietary reference intake (DRI) of 1000-1300mg/L (Milk Facts, 2024). YC had the highest P content (144.17mg/L). However, the mean values obtained in this study for P in all the fermented milk samples were lower than the dietary reference intake (DRI) of 500mg/L (Milk Facts, 2024). According to World Health Organization, the established guidelines for Ca and P levels in fermented milk are 1000-1200mg/L and 600-800mg/L respectively.

**Table 2: Mean values for calcium and phosphorus contents of the fermented milk samples**

Parameter	Milk samples							SEM	P – Value
	K	YA	YB	YC	YD	YE	YF		
Calcium (mg/L)	466.67 <sup>bc</sup>	235.00 <sup>c</sup>	370.00 <sup>c</sup>	789.50 <sup>ab</sup>	140.00 <sup>c</sup>	895.00 <sup>a</sup>	340.00 <sup>c</sup>	69.72	0.005
Phosphorus (mg/L)	58.10 <sup>ef</sup>	27.34 <sup>f</sup>	98.68 <sup>cd</sup>	144.17 <sup>a</sup>	139.27 <sup>ab</sup>	107.66 <sup>bc</sup>	70.37 <sup>de</sup>	9.49	0.000

<sup>abc</sup> Means with different superscripts in the same row are significantly different ( $P < 0.05$ ); K = kindirmo (traditional yoghurt); YA – YF = commercial yoghurts; SEM = standard error of mean

### Conclusion

The study was carried out to determine the nutritional composition of some fermented milk products sold in Owerri Metropolis, Imo state. The results showed that some of the products analyzed had high moisture content and were low in nutritional quality. It is therefore recommended that producers of these products should increase the nutrient density in order to improve the quality of their products. They should consider fortifying these fermented milk products with additional nutrients such as vitamins, minerals, and probiotics to enhance the nutritional value. Also, they should optimize protein content by using high-protein milk sources such as cow milk or adding protein concentrates to meet consumer demand for protein-rich products.

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