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Chemical evaluation of meat pies sold in some selected bakeries in Jimeta metropolis, Adamawa state Nigeria

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Research Paper

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This study was carried out to analyze the proximate and anti-nutritional factors of meat pies prepared and sold by some selected bakeries in Jimeta metropolis. Comparison of meat pies were also made between selected bakeries namely, Oasis, Frankbyte and Tasty menu. The investigations revealed that high level of moisture content of 35.0% for Oasis, 38.52% for Tasty menu and 36.19% for Frankbyte bakeries were observed. There were significant (P< 0.05) differences in the moisture content of Oasis (35.0%), Tasty Menu (26.19%) and Frankbyte (38.52%). Frankbyte meat pies had higher protein content (32.51%), followed by Tasty Menu which had 31.34% protein when compared to Oasis (29.35%). High carbohydrate content was observed in Oasis meat pies,which had carbohydrate content of 24.24%, followed by Frankbyte (17.14%). Frankbyte had the highest fat content (11.86%) compared to Tasty Menu (9.21%) and Oasis (8.43%). The analysis also showed that the anti-nutrients such as cyanide and oxalate were not detected in all the meat pies produced and sold by all the three bakeries. However, low concentration of phytate was present in all the bakeries. It was higher in Tasty Menu (0.73 mg/kg), compared to Oasis (0.3 mg/kg) and Frankbyte (0.22 mg/kg). These suggest that meat pie is an excellent source of carbohydrate, protein, fat, fiber and low concentration of phytate revealing that the meat pies prepared by all the three bakeries are safe for human consumption.

Key words: Meat pies, bakeries, proximate, anti-nutrients, chemical evaluation.

INTRODUCTION

Nutrition is the process of obtaining the food necessary for health and growth. It includes the process of ingestion, digestion, absorption, metabolism, transport, storage and excretion of those nutrients. Food plays a very vital role in maintaining proper health and also helps in prevention and cure of diseases. Good nutritive food makes health, but at the same time bad or unhealthy food gives rise to several diseases. Our cells, tissues and all organs works properly only with nutritious food which we eat. The six classes of nutrients include carbohydrate, fats and oil, protein, vitamins, water and minerals (Thomas, 2006).

Meat is one of the source of nutrients which in most communities has long occupied a specific place in the diet, for a variety of reasons including taste preference, tradition and availability with the nutritional aspect included more recently (Rcyowski, 1980).

The meat pie is a traditional old country food consisting of savoy filling in pastry shell. Traditional filling include beef, potatoes, spice and vegetable. The history of the meat pie is a bit murky, many countries laying claim to creating the first pie, the first meat pie was thought to be made in ancient Greece, they were called “Artocreas” and was simply a pastry crust onto which cooked meat

was spooned (Jensen, 1981). While it is true that meat is not essential in the diet and many people thrive on diets derived largely or even entirely from plant foods (so as long as the amount of variety are sufficient). There are many diets that will be considerably improved by the inclusion of even small amount of meat and meat products. This is because, compared with plant foods, they are concentrated sources of protein and a range for vitamins and mineral elements as little as 25 g of meat will supply 45% of daily need for protein, 7% mineral element, 25% Niacin and 14% energy (Jensen, 1981).

Meat pie is made from the combination of different ingredients depend on the choice of the person making it. But most meat pie producers use pastry, meat potatoes and some spices. For this reason, one has to determine the proximate composition in order to know the nutritional value of the meat pie. All pastries contain a high proportion of fat and the fine, rich in energy and calories, pastries also contain sugar which add to their calorie contribution.

Although, much work has been done in nutritional value and mineral composition of meat pie, sufficient attention has not been paid to their proximate composition and component such as the ash content, the moisture content, carbohydrate, lipid, crude protein and crude fiber. Due to this, it has become necessary to venture into this investigation. The aim of this study was to determine the proximate composition of the meat pies sold in Jimeta metropolis with a view of generate information on the essential nutrients packed in meat pies and also encourage people to be using it as diet or not.

MATERIALS AND METHODS

Three meat pies were collected from the three bakeries namely: Frank Byte, Oasis and Tasty menu and all were collected in triplicates.

Reagents

All reagents were of analytical grade obtained from M&B Lab and BDH Lab United Kingdom.

Area of Study

The meat pies samples were obtained from Frankbyte, Oasis and Tasty menu bakeries in Jimeta metropolitan of Adamawa state, Nigeria.

Proximate Analysis

Determination of Moisture Content (AOAC, 1990)

This measures the water content of sample. Two gram (2g) of the sample was weighed into a pre-heated, cooled and weighed silica dish. It was dried in the oven for 24 h at a regulated temperature of 80^0C to a constant weight. (The dish and the content was allowed to cool in a desiccators before weighing). The moisture was determined as percentage moisture given by:

$$\% \text{ moisture} = \frac{\text{Weight of flour before drying (g)} - \text{Weight of flour after drying (g)} \times 100}{\text{Weight of flour taken (g)}}$$

Determination of ash content

This measures the mineral content of samples. Crucibles were thoroughly beheld, cleaned and placed in a hot air-oven for 2 h and allowed to cool to room temperature in a desiccator. The empty crucibles were transferred to the muffle furnace to burn off all organic matter and also, to stabilize the weight of the crucible at the temperature of 600^0C desiccators to cool to room temperature (AOAC,1990). Two gram (2.0 g) of defatted sample was accurately weighted into the labeled crucibles, placed in the muffle furnace and ashed at 600^0C, for 3 h. At the end of the ashing period, the ashed samples were removed into a desiccator to cool to room temperature and were reweighed

$$\% \text{ Ash} = \frac{\text{Weight of crucible and ash (g)} - \text{Weight of crucible (g)} \times 100}{\text{Weight of sample (g).}}$$

Determination of Crude Protein

Crude protein was determined by method described by AOAC (1995). One gramme of each sample was weighed into separated digestion flask and 10 g of a catalyst $NaSO_4$:$CuSO_4$ and 25 ml of concentrated H_2SO_4 were added. The sample was heated on a micro digestion bench which is thermostatically controlled to remove organic carbon for 2 h. After heating, the content of the flask was left to cool and was transferred to a round bottom flask with distilled water. A little piece of anti bumping granules was added to prevent pumping and 80ml of 40% NaOH solution was carefully added, mixed and then subjected to distillation until all the ammonia passed over into the standard sulfuric acid solution. It was titrated with standard 0.55 M NaOH solution to an end point. The conversion factor 6.38 was use to get the percentage protein contents.

$$\% \text{ crude protein} = \%N_2 \times \text{conversion factor}$$

Determination of Percentage Lipid

This measures the lipid content of sample. This was done mainly by the gravimetric method of AOAC (1990). Five

gram (5 g) of sample was weighed into a thimble and apparatus was set. The lipid contained in the dry sample was exhaustively extracted using petroleum ether (40-60^{0}C) for 3 h. The extractant (petroleum ether was distilled off and the flask was re-weighed. The percentage lipid was calculated thus.

$$\% \text{ Lipid (or fat)} = \frac{\text{Weight of lipid (g)} \times 100}{\text{Weight of sample (g)}}$$

$$\% \text{ Lipid} = \frac{\text{Weigh of flask and lipid (g)-Weight of flask(g)} \times 100}{\text{Weight of sample (g)}}$$

Crude Fiber Determination

This was done using AOAC (1990) method. The principle of the method is based on loss of crude fiber when ignited after being digested with acid and base. Three grams (3 g) of the sample was defatted, the defatted sample was transferred into 600 cm^3 beaker and 200 cm^3 of boiling 1.25% H_2SO_4 was added; the content was boiled for 30 mins using hot plate. After boiling, the mixture was allowed to cool and filtered through a Whatman No. 1 filter paper. The residue was beheld with three 50 cm^3 portion of boiling water. The drained residue was quantitatively return to the original beaker and 200 cm^3 boiling 1.25% NaOH content was boiled for 30 min, filter as above, was beheld to 25 cm^3 boiling 1.25% H_2SO_4 and 50 cm^3 portion of boiling water.

Finally, the residue was drained and was beheld with 25 cm^3 alcohol. The filter paper containing the residue was dried in the oven at 130^{0}C for 2 h. It was cooled in desiccators and the contents quantitatively put in pre-weighed crucible and re-weighed again. The crucible was ignited at 55^{0}C for 2 h, cooled in desiccators and weighed.

$$\text{Crude fiber} = \frac{\text{Loss in weight on ignition (g)}}{\text{Weight of sample (g)}}$$

Determination of Total Carbohydrate

This measures the carbohydrate content and in most cases includes the fiber content of the sample.
This was conveniently done by the difference method that is:

Total CHO = 100 - (% lipid + % ash +% moisture + % protein + % Fiber).

Determination of Anti-nutrients

Determination of Oxalate

Oxalate was determined by using the method of Oke (1969). One gram of the sample was placed in a 250 ml volumetric flask, 190 ml of distilled water and 10 ml of 6 M HCl were added. The mixture was warmed in a water bath at 90^{0}C for 5 h and the digested sample was centrifuged at a speed of 2,000 rpm for 5 min. Fifty ml aliquots of the supernatant was reduced by evaporation to 25 ml, the brown precipitate was filtered off and was beheld. The combined solution and behings was titrated with concentrated ammonia solution in drops until salmon pink color of methyl orange changed to faint yellow. The solution was heated in a water bath to 90^{0}C and the oxalate was precipitated with 10ml of 5% calcium chloride ($CaCl_2$) solution. The solution was allowed to stand overnight and then centrifuged. The precipitate was beheld into a beaker with hot 25% sulphuric acid (H_2SO_4) diluted with 125 ml with distilled water and after warming to 90°C, it was titrated against 0.05M $KMnO_4$.

Determination of Phytate by Reddy (1978)

Four gram (4g) of the grinded sample was weighed into a beaker and was soaked in 100 ml of the filtrate was taken into a conical flask; 5 ml of 0.3% potassium thiocynate solution was added. The mixture was titrated with a standard solution of $FeCl_3$ until a brownish-yellow color persisted for 5 min.

The concentration of the $FeCl_3$ was 1.04 %w/v and mole ratio of Fe to Phytate = 1:1

$$\text{Concentration of Phytate phosphorus} = \frac{\text{Titer value} \times 0.064}{100 \times \text{weight of sample}}$$

Phytic acid content was calculated on the assumption that it contains 20% phosphorus by weight.

Determination of Cyanide Content

Alkaline filtration method of AOAC (1995) was adopted. Ten gram of each grinded sample was soaked in a mixture of 200 ml distilled water and 10 ml of phosphoric acid. The mixture was left for twelve hours to release all bounded Hydrogen Cyanide (HCN) (soaked to dissolve all the cyanide content). A drop of antifoaming agent (tannic acid) and anti-bumping agent was added and the solution distilled until 150 ml of the distillate was collected, 20 ml of distillate was taken in a conical flask and diluted with 40 ml of distilled water, 8ml of 6 M ammonium hydroxide and 2 ml of 5% potassium iodide solution was added. The mixture was titrated with 0.02 M silver solution using a micro burette until a faint but

Table 1. Proximate Values.

Sample	Moisture (%)	Ash (%)	Protein (%)	Fiber (%)	Fat (%)	CHO (%)
Oasis	35.01±0.027	3.02±0.004	29.35±0.001	6.51±0.002	8.43±0.006	24.24±0.005
Tasty	38.52±0.005	3.74±0.008	31.34±0.008	3.02±0.003	9.21±0.003	17.23±0.003
Frankbyte	36.19±0.094	2.52±0.004	32.51±0.003	14.19±0.091	11.86±0.010	17.14±0.007

Values are mean of three determinants ± SEM.

Table 2. Determination of Anti-nutritional Factor.

Sample	Phytate (mg/kg)	Cyanide (mg/kg)	Oxalate (mg/kg)
Oasis	0.30 ± 0.001	Not detected	Not detected
Tasty Menu	0.73 ± 0.006	Not detected	Not detected
Frankbyte	0.22 ± 0.004	Not detected	Not detected

Values are mean of three determinant ± SEM.

permanent turbidity was obtained.

RESULTS

The levels of chemical analysis of meat pies sold in some selected bakeries were shown in (Table 1).

Carbohydrates content was higher in Oasis than Tasty Menu and Frankbyte. The protein fat and fiber appear to be higher in Frankbyte than Oasis and Tasty Menu. The results also showed higher moisture content in all the bakeries and moderate ash content.

The results for proximate analysis of meat pies sold in some selected bakeries in Jimeta metropolis were presented in (Table 1).

Table 2 shows the concentration of anti-nutrient found in the meat pies. Cyanide and oxalate were not detected in all the meat pies. However, low concentration of phytate was present in all the bakeries. It was higher in Tasty Menu (0.73 mg/kg), compared to Oasis (0.3 mg/kg) and Frankbyte (0.22 mg/kg).

DISCUSSION

Chemical analysis of meat pies sold in some selected bakeries in Jimeta metropolis indicated high moisture content in all the meat pies. Tasty Menu contained higher moisture content (38.52%) compared to Frankbyte (36.19%) and Oasis (35.0%). The high moisture content suggests that the meat pies cannot be stored for longer period without spoilage (Pearson, 1976).

The results showed high protein content, in Frankbyte (32.51 ± 0.003%) compared to Tasty Menu (31.34 ± 0.008%) and Oasis (29.35 ± 0.001%) which is essential for the structure of red blood cells for proper functioning of antibodies resisting infection (FAD/WHO, 1995). In a related development, the crude protein values of 25.7% for meat pies was reported by Nobrega et al. (2006) for a beef meat and 20.5% values for chicken meat by FAO (2007).

Fat in Oasis was lower with Oasis(8.43 ± 0.006%) compared to Tasty Menu and Frankbyte which contained (9.21 ± 0.003%) and (11.86 ± 0.001%) respectively. Fat help to form and maintain cell membranes, insulate and cushion vital organs and are concentrated source of energy (Howe, 2006). The values obtained 8-11% from the research fall within the 1.5-13% as reported by Hedric *et al.* (1994). This indicated that the differences in the fat content were due to the type of meat and the moisture content which relate inversely with the fat content.

The results for ash content showed that Oasis (3.02%) and Tasty Menu (3.74%) had similar ash content, while Frankbyte had lower ash content (2.52%).The values obtained in this study fall within the range of 2.3–4.28% as reported by Rosairo et al. (1994), for oven dried kilishi (meat product). It shows that differences were due to the different amount of mineral content in the meat pies.

The carbohydrate content was found to be higher in Oasis (24.24 ± 0.005%) than Tasty menu (17.23 ± 0.003%) and Frankbyte (17.14 ± 0.007%). The CHO content of Frankbyte and Tasty Menu fall within the range (16 – 22%) of kundi (meat product) made from camel meat as reported by Hedrick et al. (1994), while the carbohydrate content of Oasis was comparable to the kundi (meat product) made from beef meat (25.00%) as reported by Lawrie (1991). It was observed that the variation in CHO content can be due to the type of slaughtered animal used, the quantity of wheat flour, and other ingredient added during preparation process. Carbohydrate is very important for the normal functioning of the central nervous system, brain and red blood cells (FAO, 1989). From (Table 2), the anti-nutrient (phytate) was detected in small amount in all the samples with Tasty Menu having the highest and Frankbyte had the lowest amounts. Both cyanide and oxalate were not detected. The anti-nutrient (phytate) has a strong binding affinity to important minerals such as calcium, iron and

zinc to form insoluble precipitate that are far less absorbable in the intestine. This can lead to iron and zinc deficiencies (Fobes et al., 1984).

Conclusion

The study revealed that meat pies were excellent sources of carbohydrates, protein, fat, fiber and water which plays a vital role in maintaining proper health and also helps in prevention of diseases. From the results, the nutritional status of meat pie from three different bakeries (Oasis, Tasty Menu and Frankbyte) in Jimeta metropolis showed that, Frankbyte contained high amount of protein, fiber and low ash content, while Oasis contained low protein, fat and high carbohydrate. Tasty Menu meat pie contained low fiber and high moisture content. Phytate was detected in small amount in all the three samples with Tasty Menu having the highest and Frankbyte the lowest amounts. Both cyanide and oxalate were not detected.

Recommendations

The results of the chemical analysis of meat pies from three bakeries (Oasis, Tasty Menu and Frankbyte) indicated that Frankbyte contained high protein content, which is essential to the structure of red blood cells for proper functioning of antibodies resisting infection. It also contained high fiber which helps to maintained normal bowel movement that reduces risk of constipation, hemorrhoids, diverticulitis and colon cancer. Frankbyte also showed to contained lower anti-nutrient (phytate) compared to the other bakeries (Oasis and Tasty Menu). Due to the above reasons, it is preferably to go for the meat pie sold in Frankbyte because it has a better nutritional content. Based on the research finding, further work should be carried out to determine the type of vitamins and mineral element contained in the meat pies.

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