Research Article

Nutritional Value and Consumer Preference of Some Selected Meat Products

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Abstract

Meat products such as beef burger, breakfast sausage, hot-dog and frankfurter required at U.T.C (United Trading Company Nigeria plc, were assessed for their proximate composition and sensory quality. Crude protein was significantly ($p<0.05$) higher in frankfurter and breakfast sausage, least in frankfurter. Fat content was significantly ($p<0.05$) higher in beef burger but statistically ($p>0.05$) similar in breakfast sausage, hot-dog and frankfurter.

The highest significant ($p<0.05$) ash content was obtained in frankfurter while hot-dog and break-fast followed next with statistically ($p>0.05$) similar ash values. Higher ($p<0.05$) moisture content (mc) were obtained in breakfast sausage and hot-dog, while frankfurter gave the least MC. The sensory indices showed hot-dog and frankfurter having the highest ($p<0.05$) score in appearance.

The taste score was significantly ($p<0.05$) higher in frankfurter and break-fast sausage.

The taste score was however similar ($p>0.05$) in beef-burger and hot-dog. Non-significant ($p>0.05$) difference were obtained in the texture, flavor and general acceptability of all the meat products. It is therefore concluded in the study that, frankfurter had better quality indices, and therefore recommended for consumers.

Keywords: Consumer; Meat Products; Quality

Introduction

Background of study

The food crisis that is facing sub-Sahara African is the deficiency of animal source of protein in food. In Nigeria today, the rapid population growth has the demand for animal protein very severe. The problem of protein deficiency in the diet of people in many developing countries has caused a lot of malnutrition diseases such as kwashiorkor among others [1].

Children of poor masses are mostly affected because of their low levels of protein, phosphorus, Calcium and vitamin intake, since their parents are mostly peasant farmers who cannot afford the exorbitant price of portentous foods like egg, fish, milk and meat.

Meat serves as a means of sustainability (food), raw material and nutritional value.

It is reported that meats contain high sodium cholesterol and saturated fat content.

The consumption of meat and poultry helps babies to have healthier growth with strong bones and teeth as a result of high content of calcium and phosphorus. It is subjected to various methods of cooking with a home, food industries and hospitality world.

Statement of problems

In sub-Sahara Africa, there is teeming increase in human population which has also led to establishment of many eateries in the urban areas. In such places, different sorts of meat products are

offered for sale but with little or scarce information on the nutritional composition and consumer preference. People who patronize such eateries therefore need to have information as to the quality of the meat products they consume.

Another major problem on hand in most developing countries is the issue of misbranding in which the nutritional value indicated to laboratory test. Hence, there is need to carry out intensive quality assessment of some meat products commonly sold in eateries.

Objectives of the study

Broad objective

The broad objective of this was to determine the effects of nutritional value and consumer preference of some selected meat products.

Specific objectives

The specific objectives are to;

1. Determine the proximate composition of some selected meat product.
2. Determine the sensory quality of some selected meat produce.

Justification of the study

Adequate nutritional intake is known to prevent malnutrition and related diseases. Since meat alone contributes high amounts of protein in human diets, there is need for proper assessment of the protein content and other nutrients in some of the meat products commonly sold in our eateries.

Significant of the study

Meat products are commonly sold in Nigeria eateries. This study will therefore offer the consumers the knowledge of nutritional value of the meat products they patronize in the eateries. This study will also offer information on likely consumer preference on some of the meat products.

Definition of terms

- **Quality**: it is something such as size, colour, feel or weight that makes one thing different from other things.
- **Assessment**: Meat is a process in which you make a judgment about a person or situation.
- **Consumer**: Someone who buys and uses product and services.
- **Preference**: These are things preferred among group of services.

- **Meat**: The flesh of animals and birds eating as food e.g pork, mutton, beef and poultry.
- **Sausage**: A small tube of skin filled with mixture of meat.
- **Recipe**: A set of instruction for cooking a particular type of meat.
- **Spices**: One of various types of powder or seed, taken from plants, that you put into food you are cooking to give it a special taste.
- **Ingredient**: One of the types of food you use to make a particular dish.

Literature Review

Meat can be defined as those animal tissues which are suitable for use as food. These are the main soft tissue of carcass, mainly skeletal (30-65%) and connective tissues. Other animal tissues used as food, and to some extent in meat, processing, are the internal organs including the blood. Meat is also made of bundle fibres, each separated fiber contain water, protein, numerous salt and extractives the fibre are joined together and connected the bones of the animals both the connective tissues. Meat vitamin and iron it contain little sulphur, calcium, phosphorus, vitamin A and vitamin D [2].

Beef (cow meat)

This is the culinary name for meat from bovine, especially domestic cattle (cow).

Beef is one of the principal meats used in cuisine of Australia, Argentina, Europe and America and also important in Africa, East - Asia and South-East Asia.

Beef is considered a taboo food in some cultures especially in Hinduism (although not strictly forbidden); it is also discouraged among some Buddhists.

Beef muscle meat can be cut into streak, roast. some cut are proceed (corned beef or beef jerky), and trimming usually mixed with meat from older, leaner cattle, are ground, minced or used in sausage. Other parts that are eating include the oxtail, tongue, tripe from the reticulum or rumen, gland (particularly the pancreas and thymus) referred to as sweet bread, the heart, the brain (although forbidden where is danger of bovine spongiform encephalopathy Bse), the liver, the kidney, and then tender testicle of the ball (know as calf tries, prairie oyster, or rocky mountain oysters) same intestine and eaten as in, but are used more often as natural sausage

casing. The lunge and udder are considered unfit for making beef stock [3].

Beef from steer's heifer are equivalent, except for steers having slight less fat and more muscle, all treatment being equal. Depending on economics, the number of heifers kept for breeding varies. Older animals are used for beef when they have past their reproductive used for minced/ground beef.

Cattle raised for beef may be allowed to roam free on grassland, or may be confirmed some stage in pen of lot, where they are usually federation mineral pre-blend.

The fresh of bovines has eaten by hunters from pre-history time; some of the earliest know cake painting such as those of Lascaux shows aurochs in hunting sciences. Domestication of cattle occurred around 8000bc, providing ready access to beef, milk and leather. Most cattle originated in the old world with the exception of bison hybrids. Examples include the wagyu from Japan, ankole-watusi from Egypt, and long horn zebu from the Indians sub-continent.

Cattle were widely used across the old for draft animal (oxen), milk production, or specifically for meat production, depending on local needs and sources. With mechanization of farming some breeds were especially breed to increase meat yield, like chianina and charolais or improve texture like the Murray grey, Angus or wagyu it. Some breeds (duals-purpose has been selected for meat and milk production, like brown (braunllieh) [4].

The word beef is from old French, in contrast to cow, which is Germanic. After the normal conquest, the French-speaking nobles who rules England naturally used were served, which the Germanic words were retained to refer to the live animals.

Thus the animal was called cu (cow) by the Anglo-Saxon (modern French beef) by the French nobles who did not often deal with the like animals when it served to them for dinner.

This is one example of common English dichotomy between the words for animals (with largely Germanic origin) and meat (with romantic origin) that is also found in such English words pairs swine/pork, sheep/mutton, cattle (beef), chicken/poultry.

Cuts of beefs

Beef is first divided into animal cuts these are basic sections from which steeves and other sub-divisions are cut, since the animals legs and neck muscles do the most work, they are then tougher, the meat becomes more Enders as distance from hoof and horn increases.

Different countries have different cuts and names

Upper half
- Chuck Rib
- Loin-short-loin
- Sir loin
- Tender loin
- Round

Lower half
- Brisket
- Shank
- Plate
- Flank

Nutrition and health

- Beef is a good source of mineral such as zinc, selenium, phosphorus, iron and vitamin B.
- Red meat is most significant dietary source of carnitine and like any other meat or fish is a source of creative [5].

Health concern

A study in 2007 by the world cancer research found reported strong evidence that red meat and processed meat are caused of bowel cancer and recommends that people eat less than 500gramms (18oz) of cooked red-meat weekly, and as little processed meat as possible.

The report also recommends that average consumption in population should not exceed 300grams (11oz) per week, stating that the goal corresponds to the level of consumption of red meat at which the risk of colorectal cancer can be clearly seen to rise. Lean beef with its high selenium and B12 content, any actual lower the risk of colon cancer.

The harassed school of public health recommends that the consumers eat red-meat sparingly as it has high levels of undesirable saturated fat.

Like some other animal product (such as milk), red-meat provides a rich source of conjugate linoleic acid which may protect against several diseases along with the saturated fat. Beef high content of B6 and B12 may help lower homocysteine.

Pork (pig meat)

Pork is eating in various forms, including cooked (as roasted, pork), curved or smoked (ham, including salami) or combination of these method (gammon, bacon or pancetta). It is also a common ingredient of sausages.

Charcuterie is the branch cooking devoted to prepare meat product, many are from pork.

Pork is a taboo items in Islamic and Judaism's, and it consumption is forbidden in these 2 religions.

The term is refers to the fresh of pig dates from middle English, derived from the French pork and Latin porcus (pig). It was one of the 500 French words pertaining to food or eating that entered English usage after normal conquest.

The pig is one of the oldest forms of livestock having been domesticated as early as 500bc. It is believed to have been domesticated either in near East or in china from the wild boar. The adoptable nature and omnivorous diet of this creature allowed early humans to domesticate in which earlier than many other forms of livestock, such as cattle.

Pigs were mostly used as food, but people also used their hide for shield and shoe, their bones for tools and weapons, and their brittles for brushes. Pigs have other roles within the human economy. Their behavior on ground makes it easier to plough, their sensitive notes lead them to truffles, and underground fungal highly valued human and their omnivorous nature enables them to eat human rubbish, keeping settlement cleaner.

Charcuterie is the branch of cooking devoted to prepare meat product such as bacon, ham and sausage are primarily from pork. Originally intended as a way to preserve meats before the advent of refrigerator, these preparation are prepared today for their flavors that are derived from the preservation processes in 15th century, France local guilds regulated tradesman in the food production industry in each city. The guild produced charcuterie were those of the charcuterie member of each guilds produced and dried meats, which varies, some time distinctively from region. The only (raw) meat the charcuterie was allowed to sell was un-rendered land. The charcuterie prepares numerous items including sausage bacon and salami [1].

Before the mass production and re-engineering of pork in the 20th century, pork in Europe and North American was traditionally an anthen dish, pigs and other livestock coming to the slaughter in the anthem after growth in the spring and fathering during the summer. Due to the seasonal nature of the meat in western culinary history, apples (harvested in late summer and anthem) have been a staple pairing to fresh pork.

The year round available of meat and fruit has not diminished the popularly of this combination western plates.

Consumption patterns

- Pork is one of the most widely eaten meats in the world accounting for about 38% of meat production worldwide although consumption varies widely from place to place.

- Despite religion restriction, of the consumption of pork and the province of beef production in the west pork consumption has been rising your thirty years, both in actual terms and in terms of meat market scheme.

- According to the USDA'S foreign agriculture services, nearly 100millions metric tons of pork were consumed worldwide in 2006 (preliminary date) increasing urbanization and disposable. Income led to rapid rise in pork consumption in china where 2006 consumption is 20% higher than in 200L, and further 5% increase project in 2007.

2006 world pork consumption

Rank	Religion	(million) Metric tons	(1kg) Per capital
1	People republic of china	52.5	40.0
2	Europe 25	20.1	43.9
3	United state	9.0	29.0
4	Russian Federation	2.6	18.1
5	Japan	2.5	19.8
6	Other	12.2	N/W
6	TOTAL	98.9	N/W

Table a

Source: USDS foreign agriculture science, preliminary data for 2006

Cuts of pork

- Heads - spear rib roasts/spare rib joint/blade
- Harm/arm shoulder/arm picnic - loin
- Belly/side/side pork - legs/arms
- Trotters - spare ribs
- Knuckle

Nutrition

In gastronomy, pork is traditionally considered a white meat, but in nutritional studies, it is usually grouped with beef as red meat, and public perception have been changing. Its mycoglobin content is lower than beef, but much higher than chicken the USDA treats pork as a need meat (Potte and Hotchkiss, 1996).

Pork is a very rich in thiamin. In 1987 the U.S.A national pork board, began an advertising campaign to positioned pork as (the other white meat) due to public perception of chicken and turkey (white meat) as healthier than red meat. The campaign was highly successful and resulted in 87% of consumer identifying pork with the slogan as of 2005; the slogan is still used in marketing pork, with some variation.

Pork, fresh, loin, whole, separable loin and fat, cooked, broiled.

Energy	(242 Kcal) 1,013kg	Energy	(242) 1,013kg
Carbohydrate	0.00g	Poly unsatu-rated	1,200kg
Sugar	0.00g	Protein	27.321kg
Dietary fibre	0.0g	tryptophan	0.338g
Fat	13.92g	threomine	1.234g
Saturated	5.2230g	Isoleusine	1.260g
Mono-saturated	0.190g	Leusine	2.177g
Lysine	2.446g	Proline	1.158g
Methionine	0.712g	Serine	1.128g
phenylalanine	1.086g	Water	57.87g
Tyrosine	0.936g	Vitamin A	2mg (09)
Valine	1.473g	Vitamin B6	0.464mg (369)
Arginine	1.723g	Vitamin B12	0.701mg (2990)
Histamine	1.067g	Vitamin c	0.6mg (107)
Alanine	1.603g	Vitamin k	0.0mg (0%)
Aspartic acid	2.312g	Calcium	19mg (2%)

Glutamic acid	4.215g	Iron	0.87mg (7%)
Glycine	1.409g	magnesium	28mg (8%)
		phosphorus	246mg (35%)
		potassium	423mg (99%)
		Sodium	62mg (3%)
		Zinc	2.39mg (240%)

Table b

Potential health risk

- Uncooked and untreated the meat may harbor worms and latent diseases many of these infestation are harbor in other animal as well, such salmonella in chicken.
- The pork is the carrier of various helminthes like round worm, pin worm, hooks worm e.t.c. one of the dangerous and common is taemia solium, a tapeworm. Tapeworm may transplant to human intestine, as well by consuming untreated or cooked meat from pigs or other animals.

Trichinosis

- Trichinosis, also called trichinellosis, is a parasite disease cause by eating raw or uncooked pork infected with the larvae of specie of round worm.
- Trichinella spiralis, commonly called the trichina worm infection was once very common, but is now rare in the developed world 1997 to 2001, and annual average of 12 case has decreases because of legislation prohibiting the feeding of raw meat garbage to hogs, increased commercially and home freezing of pork, and the public awareness of the danger of eating raw uncooked pork products.

Poultry

Poultry is the category of domesticated birds that people keep for the purpose of collecting their eggs, or killing for their meat and for feathers. These must typically are member of super-order galloanserae (foul, especially the anatidea (in order aseriformes), commonly known as (water fowl) e.g domesticated dusk and domestic geese). Poultry also include other birds which or birds consider to be game like pheasants. Poultry comes from the Latin work poule, which means to hang. The term also refers to the yeast of such birds [4].

Example

No	Bird	Wild ancestor	domestication	Killing or used for
1	Chicken	Red jungle round	South –east Asia	Meat, feather, egg and ornamentation.
2	Duck	Mallard/Muscovy duck	various	Meat, feather and egg.
3	Goose	Graylags goose/swan goose	various	Meat, feather and egg.
4	Emu	emu	Various 20th century	Meat, feather and ornament.
5	Indian peafowl	Indian pea fowl	various	Meat, feather and ornament.
6	Mute swan	Mute swan	Various	Feather, egg and land-scaping.
7	Ostrich	ostrich	Various 20th century	Meat, feather and leather.
8	Turkey	Wild turkey	Mexico	Meat and feather
9	Domesticated guinea fowl	Helmeted guinea fowl	Africa	Meat, pest consumption
10	Common pheasant	Common pheasant	Euro-Asia	Meat
11	Golden pheasant	Golden pheasant	Euro-Asia	Meat, mainly ornamentation
12	Rhea	rhea	Various 20th century	Meat, leather, oil and egg.

Table c

Cut of poultry

- The meatiest part of a bird is the flight muscles on it chest, called breast meat, and the walk muscles on the first and second segment of it legs, called the thigh and drum stick respectively.
- While meat has less oxygen carries myoglobin than the dark meats and it does higher in color.
- Dark meat comes from muscle more heavily exerted, which therefore have more feet stored in them this accounts for dark meats reputation as being both unhealthier and more flavorful than the whole meat.
- Birds that fly rarely (domestic turkey) or sporadically (chicken) have white meat breast, and birds that fly frequently or long distance (ducks, geese and birds doves) have dark meat breasts is intermediate in colour. In African, it is typically to eat the chicken while it is still alive.
- Although, many areas in African are known for their trying method when preparing any type of poultry.

Methods and Materials
Materials

Four meat products, beef burger, breakfast sausage, hotdog and frankfurter were sourced from U.T.C (united trading company) in Lagos.

Methods
Proximate composition

The meat products were analyzed for crude protein fat, moisture content. And ash using the analytical methods described by AOAC (2000).

Crude protein determination

- The crude proteins in the sample were determined by the routine semi micro kjeldahl, procedure/technique. This consist of three techniques of analysis namely digestion, distillation and titration.
- Measuring cylinder, 100ml beakers, fume cupboard.

Reagents: conc. H_2SO_4, 0.01N HCL, 40% (w/v) NaOH, 2% Boric acid Solution, methyl red-bromocresol green mixed indicator, kjeldahl catalyst tablet.

Digestion

0.5g of each finely ground dried sample was weighed carefully into the kjeldahl tubes to ensure that all sample material got to the bottom of the tubes. To this were 1 kjeldahl catalyst tablet and 100ml of concentrated H2SO4. These were set in the appropriate hole of the digestion block heaters in a cupboard. The digestion was left on for 4hours, after which a clear colorless solution was left in the tube. The digest was cooled and carefully transferred in 100ml

volumetric flash, thoroughly rinsing the digestion tube with water and the flask was made up to mark with distilled water.

Distillation

This distillation was done with Markham distillation apparatus which allows volatile substances such as ammonia to be steam distilled with complete collection of distillate. The apparatus was steamed out for about ten minutes. The steam generator is then removed from the heat source to all developing vacuum to remove condensed water.

The steam generator is then placed on the heat placed on the heat source (i.e heating mantle) and each component of the apparatus was fixed up appropriately.

Determination: 5ml portion of the digest above was pipette into the body of the apparatus via the small funnel aperture. To this was added 5ml of 40 % (w/v) NaOH through the same opening with the 5ml pipette.

The mixture was steam distillation for 2minutes into 50ml conical flask containing 10ml of 2% Boric acid plus mixed indicator solution placed at the receiving tip of the condenser. The boric acid plus indicator solution changes color from red to green showing that all the ammonium librated have been trapped.

Titration

The green colour solution obtained was then titrated against 0.01N HCL contained in a 50ml burette. At the end point or equivalent point, the green colour turns to wine colour which indicates that all the nitrogen trapped as ammonium borate $[(NH_4)_2 BO_3]$ have been removed as ammonium chloride (NH_4Cl).

The percentage nitrogen in this analysis was calculated using the formula

%N- Titre value x atomic mass of nitrogen x normality of HCL used x 4 or %N- Titre value x Normality /Morality of HCL used x atomic mass of N x volume of flask containing the digest x 100.

Weigh of sample digestion in milligram x volume of digestion for steam distillation. The crude protein content is determined by multiplying percentage Nitrogen by a constant factor 6.25 i.e. %CP=%N x 6.25.

Fat determination

- **Apparatus:** Soxhlet apparatus and accessories, oven, dessicator and analytical balance.
- **Reagents:** Petroleum spirit or either (40° - 60^0 cb.pt).
- **Determination:** 1gm of each dried sample was weighted into fat free extraction thimble and pug lightly with cotton wool. The thimble was placed in the extractor and fitted up with reflux condenser and a 250ml soxhlet flask which has been previously dried in the oven, cooled in the dessicator and weighted. The soxhlet flask in then filled to $^1/_4$ of the volume with petroleum either (b.pt 400^0 c - 600^0C), and the soxhlet extractor plus condenser set was placed on the heater. The heater was put on for six hours with constant running water from the tap for condensation of either vapour. The set is constantly watched for both leaks and the heats source is adjusted appropriately for the either to boil gently.

The either is left to siphon over several times say to cover at least 10-12 times until it is short of siphoning. It is after this is noticed that any either content of extractor is carefully drained into the either stock bottle. The thimble containing sample is then removed and dried on a clock glass on the bench top. The extractor, flask and condenser are replaced and distillation continues until the flask is practically dry. The flask which now contains the fat or oil is detached, it's exterior cleaned and dried to a constant weight in the oven. If the initial weight of dry soxhlet flask in w0 and the final weight in the oven dried flask + oil/fat is w1, percentage fat/oil is obtained by formula:

$$\frac{W1 - w0}{\text{Weight of sample taken}} \quad x \quad \frac{100}{1}$$

Moisture determination

- **Apparatus:** Oven, crucible, desiccator and balance
- **Reagent:** Silica gel, grease.
- **Determination:** 2g of the sample was weighed into a previously weighed crucible. The crucible plus sample taken was then transferred into the oven set at 100^0c to dry to a constant weight for 24 hours overnight. At the end of the 24 hours, the crucible plus sample was removed from the oven and transferred to dessicator, cooled for ten minutes and weighed.

If the weight of empty crucible is w^0

Weight of crucible plus sample is w^1

Weight of crucible plus oven dried w^3

$$(0/0DM) \; 0/0 \; \text{dry matter} = \frac{w^3 - w^0}{W^1 - w^0} \; x \; \frac{100}{1}$$

$$0/0 \; \text{moisture} = \frac{w^1 - w^3}{W^1 - w^3} \; x \; \frac{100}{1}$$

Or $0/0$ moisture = $100 - 0/0$ DM

Determination of ash

- **Apparatus:** Proclaim crucible, a dessicator, analytical balances and furnace.

- **Determination:** 2.0gm of the sample were weighed into a proclaims crucible. This was transferred into the muffle furnace set at 550^0c and left for about 4hours. About this time it had turned to white ash. The crucible and its content were cooled to about 1000^0c in air, then room temperature in a dessicator and weighed. This was done in duplicate. The percentage ash was

Calculated from the formula below

$$\text{Ash content} = \frac{\text{wt of ash}}{\text{Original weight of sample}} \; x \; \frac{100}{1}$$

Sensory evaluation

A team of ten panelists were trained and assembled to score the meat produced on taste, color, aroma, texture and acceptability using the 9 point hedonic scale.

Result and Conclusion

Proximate composition of meat products

The result obtained on the proximate composition of the meat product used in this study are presented in table 1

Sample	Moisture	Crude protein	Fat	Ash
Beef burger	25.21c	6.38c	2.23c	1.06c
Break-fast sausage	30.14a	6.91ab	1.93b	1.37b
Hot dog	30.73a	6.86b	2.01b	1.38b
Frankfurter	29.39b	7.01a	2.03b	1.45a

Table 1: Proximate compositions of meat products.

Means with different letters along the column are significantly (p<0.05) different.

Moisture content

- Moisture content obtained from the meat products ranged from 25.21% to 30.73%.

- The high values of moistures obtained in the meat products in this study suggest a faster rate of likely food deterioration.

- The observation suggests therefore, a low shelf-life. Higher moisture contents in food product promote the growth of micro-organism and enzymes which lead to food spoilage (Lutz and prytulski, 2008).

Crude protein

- The highest significant (p<0.05) crude protein content (CP) was obtained in frankfurter (7.01%). Close to this was CP content in breakfast sausage 6.91%. Beef burger and hot-dog had CP contents of 6.38% and 6.86% respectively.

- Meat from animals is known to contain essential amino-acids for good body growth and replacement of worn out tissues.

- Meat products are classified as sources of complete protein in that they supply all nine essential amino-acid in sufficient quantity to maintain tissue and support growth.

- According to Lutz and Pryzrulski, (2008), each exchange of red meat contains 7grams of protein regardless of the amount of fat. With meat product as an example of a complete protein source, the consumption of such tends to provide growth and maintenance of tissue, regulation of body processing development of immunity, circulation of blood and nutrient and backup source of energy.

Fat

- Fat content ranging from 1.98% to 2.23% were obtained in the meat products with beef burger having the highest.

- The fat content obtained in the meat products in this study goes at variance to that reported on fatty lamb meat 20% buy Lutz and pryztulski (2008), and that of lean and that of lean and fatty beef (13%) (Potter and Hotchkiss, 1996).

- Uncontrolled consumption of meat product has a tendency to make cholesterol, fat or other substances accumulates inside the artery into ways: the deposit gradually make the lumen smaller and smaller, and the fibrosis makes it progressive harder for the artery to constrict or dilate in response to the tissues needs for oxygenation blood.

Ash

Ash contents of 1.06%, 1.37%, 1.38% and 1.45% were obtained in the meat products. The ash content according to Apata (1990) is indicative of the mineral content. Lutz and Pryzrulski (2008), reported higher values of calcium, iron, potassium and sodium for red meat. According to Weaver and Hearey (1999), calcium assists strong bones and teeth formation. It also assists in manufacturing acetylcholine, a neuro transmitter enhancing transmitting of nerve impulses. It also acts as a catalyst in initiating and controlling muscles contraction and relaxation. It is a catalyst in the clothing process, and control the passage of substances across cell membrane. The iron contents of food products essentially to the formation of heamoglobin, the component of red blood cell that transport approximately 98.5% of the blood oxygen.

Sensory qualities

Data on the sensory quality of the meat products are presented in table 2.

Sample	Appearance	Texture	Taste	Flavor	General acceptability
Beef burger	6.91b	6.75	6.50c	7.10	6.30
Break-fast sausage	6.02c	6.83	7.20b	7.25	6.50
Hot-dog	7.41a	7.33	6.80c	7.50	7.25
Frank-furter	7.60a	7.42	7.90a	7.60	7.50

Table 2: Sensory quality of meat product.

Means with different letters across the same column are significant (p<0.05) different.

Appearance

The most significant (p<0.05) score for appearance was obtained in frankfurter (7.60), followed closed to this were hot-dog (7.41), beef burger (6.92) and break-fast sausage (6.02) respectively.

Texture

Texture score ranged from 6.75 to 7.42 with frankfurter having the highest score. The least score was obtained in beef burger. These score were not significantly (p>0.05) different.

Taste

The highest score of taste was obtained in frankfurter (7.90) followed were break-fast sausage (7.20), hot-dog (6.80) and beef-burger (6.50). These values were not significantly (p<0.05) different.

Flavour

The highest scores of flavor though not significant (p>0.05) was obtained in frankfurter (7.60) and hotdog (7.50) other flavor scores raised from (7.10) to (7.25) respectively.

General acceptability

Higher scores of acceptability were obtained in frankfurter (7.50) and hot-dog (7.25). Beef burger and break-fast sausage had 6.30 and 6.50 respectively.

Summary, Conclusion, Recommendation

Summary

For different meat products, beef burger, breakfast sausage, hot-dogs and frankfurters were assessed for their proximate composition and consumer preference.

The following results were obtained:

- Moisture content was higher in all the meat products.
- The highest crude protein content was obtained in frankfurter. Followed to this were the crude protein contents of break-fast sausage and hot-dog.
- The fat content was higher in beef burger than breakfast sausage, hot-dog and frankfurter.
- Ash content was higher in frankfurter.
- Sensory quality test showed higher scores of appearance in frankfurter and hot-dog.
- The highest score of taste was obtained in frankfurter while beef burger had the least.
- Texture and flavor scores were also higher in frankfurter and hot-dog.
- Meat products with highest scores of acceptability were frankfurter and hot-dog.

Conclusion

From the result obtained in this study, it is hereby concluded that frankfurter and hot-dogs were better than beef burger and break-fast sausage in nutritional composition and sensory quality.

Hence, I declare consumers can patronize these two meat products in eateries.

Recommendation

Both frankfurter and hot dog are recommended for consumption.

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