MICROBIOLOGICAL SAFETY AND PROXIMATE COMPOSITION OF GRILLED BARBECUED GOAT MEAT (*ASUN*)

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Abstract
Asun is grilled /barbecued seasoned goat meat. However, it could also be prepared from other animals based on choice or available type of animal. It is a delicacy that could be prepared by individuals at home but are available as ready to eat meat in night club centers, hotels and relaxation centers. Inadequacy of food preparation has resulted to infecting people with various diseases from vended foods. From this perspective, microbiological and proximate composition of vended asun meat samples was compared with a home prepared asun sample. Bacterial count was more in population than fungal counts from the samples. From day 0 of sample preparation, bacterial count from the self prepared asun sample increased from 16 × 10^1 to 86 × 10^3. Fungal association (8 × 10^1) was not observed until the fifth day of storage. From the purchased asun sample, mean bacterial count of 96 × 10^1 and fungal count of 33 × 10^1 was observed from day 0 of preparation. The bacteria isolated from self prepared samples were Staphylococcus aureus and Mucor mucedo while from the purchased samples Escherichia coli, Clostridium perfringens, Staphylococcus aureus, Shigella dysenteriae, Salmonella typhi, Streptococcus faecalis, Aspergillus flavus, Rhizopus stolonifer, Aspergillus niger and Neurospora crassa. The proximate composition, mineral contents and sensory evaluations of the asun samples were of better characters in the home prepared than the purchased samples.

Keywords: Proximate composition, goat meat, microbiological, safety

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Introduction
Asun is grilled /barbecued meat seasoned with pepper, onion, ginger and some other spices that gives it irresistible sweet aroma. *Asun* is prepared majorly with goat meat. However, it could also be prepared from sheep, cow, chicken and pig meat based on choice or available type of meats. It is a delicacy that could be prepared by individuals at home but are available as ready to eat meat in night club centers, hotels and relaxation centers.

Goats are widely distributed around the world with high demand to their meat, milk and skins (Anaeto et al., 2010; Yangilar, 2013). Goats are bred in Nigeria majorly for their meat and are consumed by all localities due to its availability, nutrition derived and quality meat than beef and other ruminants. Lean goat meat is low in fat and saturated fatty acids, but high in unsaturated fatty acids such as linoleic and oleic that has been shown to possess hypocholesteremic properties (Dawkins et al., 1999; Mahan and Escott-Stump, 1996)). The chemical composition of goat meat is as follows: moisture 74.2–76.0%; protein 20.6–22.3%; fat 0.6–2.6%; ash 1.1% (Devendra, 1988) Goat meat cuts have protein levels comparable to similarly prepared beef, lamb, and veal but have lower fat content (James *et al*., 1990). In addition, the percentage of saturated fat in goat meat is lower than in chicken, beef, pork, or lamb (Banskalieva et al., 2000; USDA, 1989). Considering its high nutritional value and its greater unsaturated to saturated fatty acid ratio, goat meat has the potential to improve the health of susceptible population without taking meat products out of their daily diet. Consumption of goat meat is becoming popular and is often available at the fine dining level (Packaged Facts, 2007).

With popular demand and high cost of foods and food products, many food vendors and eatery centres are faced with numbers of challenges such as maintenance of high-quality standards, purchase of quality material and assurance of food safety while avoiding liability issues. Quality and safety of food are usually defined by physical attributes (e.g.,

texture, color, marbling, tenderness), chemical attributes (e.g., fat content, moisture, protein content, pH, drip loss), and biological attributes (e.g., total bacterial count) (Huang et al., 2014). Meat as high energy type of food is considered to be the food of choice due largely to its many nutrients, especially protein, B vitamins, iron and zinc. As a nutritive dense food, meat provides major nutritive contributions to diets relative to the amount of calories it, contains. Meat, an excellent source of protein in human diet is highly susceptible to microbial contaminations, which can cause its spoilage and food borne infections in human, resulting in economic and health losses (Komba et al., 2012). Before the consumption of meat, it is cooked, smoked or fried. The processing operations of meat are to preserve and increase the shelf life in addition to improving the palatability and food value of meat.

Asun is a tropical moisture meat product. Because of the contained water activity (aw), it cannot be keep for long at room temperature without deterioration. Outside *suya*, (another meat product) it is a leading meat product demand in hotels and eatery centres in Nigeria. This however led to the microbial assessment of *asun* prepared at home in comparison with the commercially prepared samples.

Materials and Methods

Preparation of *Asun*

Goat meat cut to small different sizes was placed in cooking pot and little quantity of water was added. When the meat is properly done, salt was added and stirred. The meat was grilled for some times in the pot with constant stirring until the water is dried up. Thereafter, the grilled meat was removed from the pot and fried with vegetable oil on addition of ground pepper and other spices including seasoning. This was stirred together till ingredients are evenly distributed on the meat.

Preparation of *asun* samples for microbial culture

From the prepared and commercially purchased *asun* samples, twenty grammes each of sample was weighed and homogenized with 200 ml peptone water. One milliliter aliquot was obtained with a sterile pipette and subsequently diluted to 10^{-9}

Enumeration of microbial load from samples

From the diluted samples, One milliliter (1 ml) each of inoculums from10^{-5} - 10^{-7} dilutions was plated with freshly prepared molten plate count agar and malt extract agar for respective bacterial and fungal growth. Bacterial culture plates were incubated at 37 °C for 24hrs and fungal culture plates at 27 $\pm$ 2 ^{o}C for 72 hours. After incubation, resultant bacterial and fungal colonies on plates were counted and reported as colony forming unit (cfu/g) (bacteria) and spore/g (fungi).

Enumeration and detection of bacterial pathogens from samples

For *Staphylococcus aureus*, 1 ml aliquot sample was culture on mannitol salt agar and incubated at 35 ºC for 24 hours. Following incubation, mannitol fermenting organisms which showed a yellow zone surrounding their growth were counted, purified by streak method and pure isolates were slanted for biochemical tests. Coliform bacteria were cultured by pour plating 1 ml of samples with MacConkey agar and incubated at 37 ºC for 24 hours. Reddish colonies were counted. The reddish colonies from these plates were streaked on to Eosine methylene blue (EMB) agar plate and incubated at 37 ºC for 24 hours. Following incubation, colonies which formed bluish black colour with green metallic sheen were noted and counted as Escherichia coli. Pure colonies on streaking were slanted for biochemical tests to confirmatory identity. For *Clostridium perfringens* detection, the method described by Cheesbrough (2000) was adopted. One milliliter aliquot of samples was inoculated onto neomycin blood agar and incubated anaerobically at 37 ºC for 24 hours. Following anaerobic incubation, large β-haemolytic colonies on culture plates were counted and purified for identity.

To detect *Salmonella* species from samples, the method of FAO (1979) was adopted. One milliliter of sample was inoculated onto

selenite cystine medium and incubated at 37 ºC for 24 hours

Identification of isolates

Isolated bacteria were purified by streaking on freshly prepared nutrient agar and incubated at 37 ^{o}C for 24 hours. Purity was confirmed by Gram stain. Purified bacterial species were characterized and identified with the methods describe by Harrigan and McCance, (1976) and Holt *et al*. (1994).

Screened fungal isolated were identified on the taxonomic schemes and descriptions by Fawole and Oso, (1998).

Proximate analyses of samples

Determination of moisture content

Moisture content was determined by weighing 10 grammes of *asun* sample and drying to constant weight in an oven at 80 ^{o}C; and reweighing the sample. The moisture content was determined as the difference in weight between the fresh sample and the oven-dried sample. This was expressed as percentage (%) of the total weight of the sample.

Calculation was expressed with the formula below

$$\text{Moisture content} = \frac{\text{Loss in weight of sample}}{\text{Weight of fresh sample}} \times 100$$

where MC = Moisture content (%), LWS = Loss in weight (of sample) and WFS weight of fresh sample.

Determination of crude protein

Crude protein of the samples was determined by the method described by AOAC (1990). Dried samples were ground and used for determination of crude protein by kjeldahl method to obtain the nitrogen content which was multiplied by 6.25 (a constant for conversion of free nitrogen content to crude protein).

Determination of ash content

This was determined by heating 10 g sample at 600 ^{o}C using muffle furnace (Laboratory electric furnace, typOH-857R, England) for 18 hours as described by Pearson, (1976).

Determination of crude fat

Crude fat was determined by hydrolysis method using soxhlet apparatus according to AOAC, (1990) method.

Determination of Free fatty acids

The free fatty acid from samples was determined by the method of Slack, (1987) whereby free fatty acids (FFA) were extracted from *asun* using (Leatherhead Food at room temperature, Bligh and Dyer extraction by method No. 2 for fat extracted from food).

Determination of pH

The pH of *asun* samples was determined using a pH meter after standardization with pH 4, 10 and 7 buffers. All analyses were performed in duplicate.

Determination of mineral contents

Using the dry ashing procedure as described by AOAC (1990) with Atomic absorption spectrophotometry method, parameters such as Sodium (Na), magnesium (Mg), iron (Fe), calcium (Ca) and potassium (K) were determined from the *asun* samples.

Sensory Evaluation

Sensory evaluation of self prepared and purchased *asun* samples were rated by ten regular consumer of *asun*. In warm form, the panelists were served with half filled dish of each *asun* sample and water was provided to fresh mouths between each sample. A 9-point hedonic scale was used to assess the following: flavour, juiciness, colour appearance, tenderness and overall acceptability. Scores were assigned with 9 being ‟like extremely‟ and 1„ dislike extremely‟ (Dhanda et al., 1999).

Statistical analysis

The results were expressed as mean ± standard deviation (SD) and were subjected to one way analysis of variance (ANOVA). The least significant difference (LSD) was performed for the pair wise mean comparisons, to determine the significant treatment dose at 95% level of confidence. Values were considered statistically significant at (P<0.05).

Results and discussion

The mean total microbial counts from the asun samples are reported in table 1. Bacterial count was more in population than fungal counts from the samples. From day 0 of sample preparation, bacterial count from the self prepared *asun* sample increased from 16×10^1 to 86×10^3 while there was no record of fungal association until the fifth day of storage where a count of 8×10^1 was observed. From the purchased *asun* sample, mean bacterial count of 96×10^1 and fungal count of 33×10^1 was observed from day 0 of preparation.

Table 1: Total microbial load in *asun* samples maintained at 28±2 °C

Days	Self prepared asun		Purchased ready to eat asun	
	TVBC	TVFC	TVBC	TVFC
0	16×10^1	NIL	96×10^1	33×10^1
3	24×10^1	NIL	1.18×10^3	47×10^1
5	32×10^1	8×10^1	1.36×10^3	62×10^1
7	86×10^1	13×10^1	1.73×10^3	83×10^1

Legend: TVBC =Total viable bacterial count. TVFC= Total viable fungal count

These increased tremendously in the samples to 1.73×10^3 cfu/g and 83×10^1 spore/g respectively until the seventh day of storage. *Asun* is a meat product and the various processes involved is to achieve good taste, The pathogenic bacteria isolated from self prepared samples were *Staphylococcus aureus* and *Mucor mucedo* while from the purchased samples *Escherichia coli*, *Clostridium perfringens*, *Staphylococcus aureus*, *Shigella dysenteriae*, *Salmonella typhi*, *Streptococcus faecalis*, *Aspergillus flavus*, *Rhizopus stolonifer*, *Aspergillus niger* and *Neurospora crassa* were characterized (Table 2).

From purchased samples, some pathogenic bacteria were enumerated and *S. dysenteriae* count was more in the samples, followed by *S. aureus*, *S. faecium* and *E. coli*. *Escherichia coli* population in the samples increased from 27×10^1 cfu/g in day 0 of preparation and increased to 1.28×10^3, *S. aureus* increased from 1.03×10^3 cfu/g to 1.55×10^3, *S. dysenteriae* increased from 84×10^1 to 2.15×10^3, *S. faecium* from 53×10^3 cfu/g to 1.56×10^3 (Table 2). These identified microorganisms might not be directly from the meat samples but from environment or human contamination during the process of aliquot preparation for microbial enumeration. From the purchased *asun* samples, higher microbial load was observed even at day zero of preparation and some eliminate microbial contaminations present in fresh meat for preparation and enrich the meat with the lots of ingredients for nutritional values to humans. Some numbers of pathogenic and spoilage microorganisms have been isolated from raw goat meats (Moawad et al., 2013; Voidarou et al., 2011; Okonko et al., 2010; Eze and Ivuoma, 2012). These organisms are responsible for foodborne infections and fast deterioration after improper processes or preparation of meats. Low microbial load from self prepared samples was enumerated over the commercially prepared *asun*. The low microbial load observed suggested adequate preparation from the perspective of microbial contamination of raw meat during slaughtering and sale. pathogenic bacteria were identified. These observations suggested inadequacy in the samples preparation which might emanate from meat, materials for meat processes and ingredients not properly cooked because of gross production for consumers. The number of pathogenic bacteria present in the purchased *asun* samples during storage increased which could have been destroyed if cooked adequately. Despite the fact that *asun* is not served cold, the kind of warming given to it by sellers before serving to customers might not be enough to ensue eradication of microorganisms if they have initiated a reasonable load. From public health perspective, this may be involved in one form of foodborne problem or the other. Public Health Laboratory Service Guidelines for the bacteriological quality of ready-to-eat foods at the point of sales considers a food unacceptable if the level of Salmonella and *S. aureus* are in the order $> 10^5$ CFU/g and $> 10^3$ CFU/g respectively (PHLS, 2003). It is majorly difficult to avoid *Staphylococcus aureus* from ready-to-eat foods but the high Staphylococcal count in the purchased ready to eat *asun* is a

point of concern since the growth of *Staphylococcus aureus* to a population of 10^5 cfu/g is considered necessary for the production of 1µg of enterotoxin sufficient to cause intoxication if such food is consumed, However ICMSF (1986) indicated that 10^6 cells of *S. aureus*/gram is required to present the risk of intoxication. Staphylococci, which are natural flora of skin and mucous membranes of animals and humans, have been reported to cause meat contamination (Nørrung *et al.*, 2009). Ahmed et al., (2013), reported mean *S. aureus* counts of 2.80, 3.07 $\log^{10}$ CFU/cm^2 respectively from abattoirs and retail outlets meat. Mean *E. coli* counts for goat meat from abattoirs and retail outlet were 2.86, 1.94 log10 CFU/cm^2 respectively (Ahmed et al., 2013). The presence of *E. coli* strains in meat and meat products have been studied by many researchers (Alvarez-Astorga et al., 2002; Doyle, 2007; Eze and Ivuoma, 2012). *Shigella dysenteriae* count from purchased asun samples outnumbers the permissive level in ready to eat foods. This is a concern that calls for alarm as <10 cells could cause infection depending on the health status of consumer of such foods. The increased microbial load during period of storage was enhanced by the nutrient contents of *asun* samples. Komba et al., (2012) reported that meat is an excellent source of protein in human diet and it is highly susceptible to microbial contaminations, which can cause its spoilage and food borne infections in human, resulting in economic and health losses. From the perspective of the level of microbial contamination of fresh meat, holding *asun* in warm condition after the general cooking will help in reduction of microbial load to a minimum though it might affect some nutrients derived from meat.

Proximate composition of *asun* samples for seven days storage at room temperature is presented in table 3. The self prepared sample's moisture content of 32.26 ± 1.4% at day zero of preparation increased to 30.24± 0.2% at day seven. The moisture content recorded from purchased *asun* sample at day zero was 38.6 ± 1.2% and thereafter increased to 56.6 ± 0.2% at day seven after sample preparation. The moisture contents of the *asun* meat samples were high due to the preparations involved. This might induced the higher bacterial than fungi contamination. Fresh goat meat moisture content ranged from 74.2 - 76.0% of which only reduction of between 43 - 50% was observed from the *asun* samples. This reduction resulted from the processes of cooking and frying which ordinarily will not prevent microbial growth and increase during storage. Drying fresh lean meat to 20% moisture inhibits most bacteria, yeast and moulds, while a level of 15% moisture is needed to inhibit some species of fungi (Ingram and Simonsen, 1980).

Table 2: Pathogenic bacteria count in *asun* maintained at 28±2 ^{o}C

Days	*Escherichia coli*		*Clostridium perfringens*		*Staphylococcus aureus*		*Shigella dysenteriae*		*Salmonella typhi*		*Streptococcus faecalis*	
	SPA	PRA	SPA	PRA	SPA	PRA	SPA	PRA	SPA	PRA	SPA	PRA
0	NIL	27×10^1	NIL	NIL	16×10^1	1.03×10^3	NIL	84×10^1	NIL	NIL	NIL	53×10^1
3	NIL	92×10^1	NIL	NIL	24×10^1	1.13×10^3	NIL	1.22×10^3	NIL	NIL	NIL	89×10^1
5	NIL	1.02×10^3	NIL	NIL	32×10^1	1.34×10^3	NIL	1.74×10^3	NIL	NIL	NIL	1.04×10^3
7	NIL	1.28×10^3	NIL	NIL	86×10^1	1.55×10^3	NIL	2.15×10^3	NIL	NIL	NIL	1.56×10^3

Legend: Self prepared *asun* (SPA), Purchased ready to eat *asun* (PRA)

Table 3: Proximate composition and pH of *asun* for 7 days storage

Days	Moisture		Crude protein		Ash content		Crude fat		Free fatty acid (%)		pH	
	SPA	PRA	SPA	PRA	SPA	PRA	SPA	PRA	SPA	PRA	SPA	PRA
0	32.26 ± 1.4^c	38.6 ± 1.2^d	43.18 ± 0.3^a	40.23 ± 1.4^a	3.23 ± 1.4^a	3.27 ± 1.2^a	13.6 ± 0.2^a	16.3 ± 1.2^a	0.65 ± 0.21^{bc}	0.75 ± 1.6^d	6.2 ± 0.2^{bc}	6.5 ± 0.2^{ab}
3	36.40 ± 0.1^b	45.7 ± 0.4^c	42.14 ± 1.4^{ab}	36.20 ± 0.4^b	3.20 ± 1.4^a	3.24 ± 1.2^b	13.6 ± 0.2^a	15.5 ± 1.2^b	0.65 ± 0.21^{bc}	1.82 ± 1.2^c	6.2 ± 1.2^{bc}	6.7 ± 0.2^{ab}
5	36.40 ± 0.1^b	55.1 ± 0.1^b	40.16 ± 1.4^b	30.42 ± 1.4^c	3.15 ± 1.4^{ab}	3.22 ± 1.2^b	13.7 ± 0.2^a	14.7 ± 1.2^c	$0.73\pm0.1.3^{ab}$	2.34 ± 2.0^b	6.4 ± 1.2^b	7.0 ± 0.2^b
7	38.24 ± 0.2^a	58.6 ± 0.2^a	40.16 ± 1.2^b	27.36 ± 1.2^d	3.12 ± 1.4^b	3.18 ± 1.2^b	13.2 ± 0.2^b	14.5 ± 1.2^c	0.76 ± 0.02^a	3.46 ± 1.6^a	6.5 ± 0.2^a	7.5 ± 0.2^a

Legend: Self prepared *asun* (SPA), Purchased ready to eat *asun* (PRA)
Means with different superscripts in the same row are significantly different (P<0.05).
All mean and standard deviation are of triplicate values.

Higher protein content was recorded from self prepared sample than the purchased samples. However, slight decrease from 43.18 ± 0.3% at zero day to 40.16 ± 1.2% at seven day after preparation, while in the purchased samples, rapid decrease from 40.23 ± 1.4% at zero day to 27.36 ± 1.2% at day seven after preparation. Fresh goat meat protein content is in the range of 20.6 – 22.36% but higher protein values were recorded in the self prepared and purchased ready to eat *asun*. This simplified that goat meat will be better for human nutritional value if processed. The high protein content of *asun* may have been contributed by the major ingredients. The high protein content of *asun* makes it suitable to be combined with drinking of beer and non alcoholic beverages that have low protein content but high carbohydrate and water contents. Ash content recorded from self prepared sample at zero day of preparation was 3.23 ± 1.4% and decreased to 3.18 ± 1.2% in the seventh day after preparation. The purchased has ash content percentage of 3.27 ± 1.12 at zero day and decreased to 3.18 ± 1.2 in the seventh day of storage. Ash content from the self prepared and purchased ready to eat *asun* was higher when compared with fresh meat which usually contains about 1.1% on wet basis as reported by Devendra, (1988). This could have been contributed by the added ingredients.

Crude fat from both samples also were affected during the storage period. The percentage crude fat obtained from the self prepared sample was 13.6 ± 0.2 at zero day and subsequently decreased to 13.2 ± 0.2% , while in the purchased samples, it was 16.3 ± 1.2% at zero day but decreased to 14/5 ± 1.2% in the seventh day of storage. Storing *asun* meat possessed some defects in its nutritional value. There was increase in free fatty acid (FFA) with storage time. As meat ages, the fat deteriorates through microbial attack and tissue enzyme activity which causes the development of free acidity and oxidation of unsaturated fatty acids. The presence of oil adds to the flavour derived from *asun* meat product, but the oil used for frying the meat might have increased the FFA level which mostly was manifest during storage. Pearson (1968b) stated that for odour to be acceptable the free fatty acid (FFA) should not exceed 1.2%. However, FFA level in *asun* purchased from commercial centres exceeded this limit at storage period. Though, it is possible that off-flavour and odour may be difficult for consumers for acceptability, the periodical warming treatment to minimize spoilage might hinder an elaborate off-flovour and odour for many consumers to notice in many days prepared *asun* in some night clubs and eatery centres. Consumption of such meat may result in health hazard hence it has been reported that increased free fatty acid (FFA) concentrations are typically associated with insulin-resistant states in human skeletal muscle by reducing insulin-stimulated glucose transport activity and such may play an important role in causing the insulin resistance associated with obesity and type 2 diabetes mellitus (Frayne, 1993; Reaven, et al., 1988; Alan et al., 1999).

pH values was increased in both samples during storage period. Slight increase in pH was recorded from self prepared samples where a value of 6.2 ± 0.2 at day zero of preparation increased to 6.5 ± 0.2 in the seventh day of storage. The purchased *asun* samples pH was valued for 6.5 ± 0.2 at day zero and gradually increased to 7.5 ± 0.2 in day seven after preparation (Table 3). The pH of food sample determines the number and kind of contaminating organisms. The high pH observed mainly from the purchased *asun* samples is reasonably an evidence of the growth of microorganisms and their increase in samples during storage while the degree of stability in pH from the self prepared *asun* samples was responsible for the low microbial count.

In general overview, the differences in the proximate composition of the self prepared and purchased *asun* could either be from the status of the animal used in its production or the processing methods employed. The status of the animal also determines its proximate composition. Animals with malnutrition or suffering from one illness or the other before slaughter certainly would not have same composition as the healthy ones. Also, meat slaughtered for quite a period of time and acted

upon by microbes or enzymes before preparation have the potentials of affecting the meat quality. This might be the differences in proximate compositions observed in the two samples.

Higher mineral compositions were obtained from the self prepared *asun* than the purchased read to eat *asun* sample. Nevertheless, there was no significant difference in iron and calcium values in both samples, while significant difference occurred in magnesium, sodium and potassium (Table 4).

Table 4: Mineral contents of *asun* samples

	Trace elements (mg/100g *asun*)				
	Sodium (Na)	Magnesium (Mg)	Iron (Fe)	Calcium (Ca)	Potassium (K)
SPA	72.19^{a}	19.64^{a}	3.62^{a}	11.36^{a}	265.12^{a}
PRA	65.14^{b}	19.21a^{b}	3.60^{a}	11.28^{a}	234.35^{b}

Legend: Self prepared *asun* (SPA), Purchased ready to eat *asun* (PRA).
Means with different superscripts in the same row are significantly different (P<0.05).
All values are mean and standard deviation, (n=3)

The mineral component results from both samples were similar to those obtained by Anaeto et al., (2010).; Moawad et al., (2013). The *asun* samples from analysis were rich in calcium, iron, potassium, magnesium and sodium. Calcium and iron are important elements for preventing iron-deficiency anemia, as well as for bone development, secretory functions, buffers, and certain co-enzymes (Keeton and Eddy, 2004). Potassium and magnesium have been reported being necessary for many essential biochemical reactions (Mioc, et al., 2000).

Table 5 represents the sensory evaluation values where it was only in colour appearance of both sample values that significant difference occurred.

Table 5: Sensory evaluation rates

	Flavour	Juiciness	Colour appearance	Tenderness	Overall acceptability
SPA	7.66±0.34^{a}	7.57±0.52^{a}	6.73±0.46^{a}	6.87±0.45^{a}	7.12±0.41^{a}
PRA	5.41±0.32^{b}	6.55±0.43^{b}	6.82±0.54^{a}	5.36±0.46^{b}	6.32±0.53^{b}

Legend: Self prepared *asun* (SPA), Purchased ready to eat *asun* (PRA)
Means with different superscripts in the same row are significantly different (P<0.05).
All values are mean and standard deviation, (n=10)

The higher values in flavour, juiciness and tenderness rated the self prepared *asun* sample over the purchased ready to eat samples in the overall acceptability. The low quality in proximate composition of the purchased ready to eat *asun* meat could have greatly affected the sensory evaluated by taste panel members. In spite of both products were prepared from goat meat with known method for *asun*, the result inference marginalized the self prepared *asun* from the purchased ready to eat *asun* in flavor, juiciness, tenderness and overall acceptability. colour appearance in the meat products can be varied by animal age, specie type and muscle colour. Dhanda et al. (1999) reported that muscle colour is greatly influenced by the concentration and chemical nature of haemoprotein present in the muscle. Though acceptability score was higher in the self prepared *asun* due to its good preparation from the perspective of microbial load and proximate composition, it should be noted that type of goat (he/she) age and species have great influence in the overall acceptability in flavour, tenderness and juiciness. So, we cannot however deduced precisely that it was the good preparation of the self prepared *asun* that deserved its higher acceptability by taste panelists hence the type, age and species of goat used for the *asun* samples are not known.

Conclusion

Asun as a nutritive meat delicacy and of high choice to majority of people requires good preparation practice to avoid infecting consumers with pathogens. The high microbial counts in the purchased ready to eat asun, resulted to its lesser nutritive value thus its low acceptability. Flavour, juiciness and tenderness are of necessity in quality asun and high moisture content leads to microbial attack and will effects its shelf life.

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