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Research Article

Quality Attributes of *Suya* from Indigenous Goat Breeds (Bucks) in Nigeria

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Abstract

A study was conducted to evaluate the percentage yield (%), proximate composition and organoleptic evaluation of the freshly prepared Suya product from indigenous goat (buck) breeds in Nigeria .Thigh muscle with average weights of 3.1±0.2 kg was excised from the carcasses of 9 fully matured bucks managed intensively for 90 days. The Chevon were dissected into smaller pieces of 10 cm long. The meat samples were thereafter trimmed of visible fats. They were also finely trimmed to very thin sheets of meat about 0.22 - 0.32 mm in thickness and with a length of about 4.5 cm - 9.3 cm. A total of 99 Suya sticks was prepared with 11 from each buck weighing approximately 88.50 g per stick. Suya ingredients used for the experiment were sourced from Bodija Market, Ibadan. The results showed that weight losses were considerable in all the treatments but the yield was not significantly different (P>0.05) among the breeds. There was also no significant difference in moisture contents among the treatment groups while the protein, ether extract and crude fibre differed significantly across the treatments. Texture of Suya from Sahel bucks with 6.81±0.3 was significantly higher than 5.4±0.3 and 5.5±0.4 for WAD and Red Sokoto bucks respectively. The overall acceptability of Suya from Sahel bucks with 6.24 and Red Sokoto bucks with (6.9±0.1) were similar and most accepted than 5.10 of that from West African dwarf bucks.

Keywords: *Thigh muscle, Suya, Chevon, Suya acceptability, Yield*

Introduction

Suya is one of the intermediate moisture products that are easy to prepare and highly relished (Omojola *et al.*, 2004). It is a traditional stick meat product that is conventionally prepared from beef by the Hausas in West African countries. It is usually produced from boneless meat hung on stick and spiced with groundnut cake, pepper, salt, vegetable oil and other flavours which is followed by roasting over a glowing fire (Adesokan *et al*., 2008). *Suya* like any other meat products, command high value and are well patronized by most people including average income earners. However, beef *suya* has relatively high fat content which reduces its quality and meat value. Other meat type such as chevon could be a better alternative due to its low fat content and high meat value (Ayanniyi, 2018). Goats that are native to Nigeria are three and they include the Sahel goats which are commonly found in the extremely drier region of country. They are not trypanotolerant, long legged, tall breeds, less meaty Anurudu (2011) however they have comparatively low fat as against the other two breeds. The second, Red Sokoto or Maradi bucks are distinctively red goats predominant in most Northern State. Like other red meat, Maradi goat is a rich source of nutrients and but highly

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popular owing to its peculiar skin characteristics used in leather industry. They are less meaty, less fat and consumed worldwide in large quantities especially in the developing countries in form of stew or in processed form of intermediate moisture products such as *Balangu* and *Suya* (Park *et al*., 1972; Egbunike and Okubanjo, 1999; Banani *et al.,* 2006). WAD bucks on the other hand are relatively common in parts of the southern States. *Suya* as a meat product has been largely prepared from beef. However, beef *Suya* has relatively high fat content which reduces its quality and sometimes costly. *Chevon*, with less fat and high meat value could be a better preference. Information of the use of *Chevon* for *suya* preparation has not been adequately documented. Therefore, the aim of this work was to use selected indigenous breeds of goat to prepare *suya* and determine the meat yield.

Materials and Methods

The meat used for the experiment was the thigh muscles from each buck averagely weighing 3.1±0.2 kg. The animals after slaughtering were skinned and cut into primal cuts.

The chevon harvested were dissected into smaller pieces of 10 cm long. The meats samples were thereafter trimmed of visible traces of fats. They were also finely trimmed to very thin sheets of meat about 0.22 - 0.32 mm in thickness and with a length of about 4.5 cm - 9.3 cm using a thin knife. The slender sticks used to stake the sliced chevon were obtained from Livestock section of the Akinyele market, Oyo road in Akinyele Local Council, Oyo State. A total of 99 *Suya* sticks was prepared with average of 11 *Suya* sticks from each buck of approximately 88.50 g per stick. The sticked *Suya* were labelled according to the breeds, A for Sahel, B for WAD while C represented Red Sokoto bucks.

The condiments used for *Suya* ingredient were sourced from Bodija Market in Ibadan, Oyo State Nigeria. Following the purchase of the spices, they were cleaned of dust if any and sundried. They were thereafter grinded and thoroughly mixed together. *Suya* ingredients were placed on a dry, clean and flat tray from which each *suya* stick dusted with the ingredient according to Omojola *et al.* (2004) procedure. Each *suya* sample was roasted in a period of approximately 22-25 minutes.

Out of 99 sticks of *Suya* prepared, only 75 were selected and used for *Suya* evaluation with an average of twenty five (25) from each breed.

Parameters measured

The percentage loss of fresh *Suya* was calculated by finding the difference between the weights of *Suya* before (W1) and after (W2) roasting and divided by weight before roasting (W1) and multiplied by 100.

Thus percentage cooking loss of *Suya:*

$$= \frac{\text{Weight before roasting (W1)} - Weight \text{ after roasting (W2)}}{Weight\ before\ roasting\ (W1)}\ x\ 100$$

Suya samples from the three bucks were collected and the proximate composition evaluated.

Suya yield was calculated using a simple arithmetic method of deducting the loss from a hundred percent as recommended by Kembi and Okunbajo (2002). It is actually the ratio of the *Suya* final weight to the initial weight of the fresh meat samples.

Suya yield (%) = 100% - cooking loss

Fresh *Suya* samples were served to the sensory panels when they were cooked. The panel which consists of semi trained judges were made up of 7 each (with average age of 24-44 years old) of men and women. Coded *Suya* samples were served and grading sheet with a 9- point hedonic scale was offered to the panel. The panellists were made to rate each of the replicate of the suya products with maximum score of nine extremely high conditions while the lowest score of 1 was assigned the poorest (Mahendraker *et al.,*1998). The following organoleptic traits were assessed on each of the *Suya* sample: flavour, texture, tenderness, aroma, juiciness and overall acceptability. Cracker biscuits and cold clean water were served after each treatment to obtain as much as possible an unbiased results for the samples.

The design for the experiment was Completely Randomized Design (CRD), data were collected and analysed using SAS (2002)

Results and Discussion

Finding from this work showed that percentage loss as a result of the *Suya* processing was considerable among the breeds but yet no significantly differences from one another (P>0.05) among the breeds. The percentage yield of *suya* of (62.31 %) Sahel, (64.94 %) WAD bucks and Red Sokoto (67.11 %) were not significant but lower than 70.63 % and 75.12 % reported by Agnihotri and Pal (2000). The results were also far less than the range of 71.37 % to 87.72 % observed by Omojola (2008) for three different muscle types from 4-year old White Fulani bull. The range of *suya* yield (62.31% to 67.11%) may be probably because goat is generally leaner than other meat types and also to losses owing to different cooking methods of roasting

Cooking loss

Cooking usually may lead to reduction in weight of food product most especially on heating. It is dependent on the cooking methods employed, be it roasting, broiling, steaming, stewing or smoking. The different cooking losses however may be because of different water holding forces of the chevon harvested from the breeds and the heat supply. Often times, there exist a direct relationship between cooking loss and the muscle binding forces of meat. Muscle with strong binding force will lose less moisture compared with that of weak forces. As a result, chevon from both Sahel and Red Sokoto bucks lose more moisture than from WAD bucks. This could be probably because the force within their muscle fibres are weak water holding forces than that from WAD bucks. A principle which was earlier predicted by Fakolade and Omojola (2008) that both the water binding capacity and cooking loss are related because they have an inverse relationship. While one is higher the other is comparatively lower. The cooking losses of the *suya* observed from this study which showed that the losses of both chevon from Red Sokoto and Sahel breeds were similar except for WAD bucks which was a bit higher. The average cooking loss value (34.45 %) obtained from the present study fell within 33.00 % and 35.77 % as earlier observed by Mohammed *et al*. (2004) for *Capretto* and *Chevon* respectively.

Table 3 shows the sensory evaluation of *Suya* produced from thigh muscle harvested from the hind leg of the three indigenous goats (bucks) breeds in Nigeria. The flavour ratings did not differ significantly (P >0.05) from each other which might have been influenced by the relative heat supply during roasting coupled with the inherent effects of the spices inclusion. On the other hand, the taste judges rated s*uya* from Sahel bucks as having highest tenderness of 6.53 and texture of 6.76 scores compared with 5.56 and 5.41 from WAD bucks. Breed effect significantly influenced the juiciness of s*uya* ratings; the score of 6.29 % from *suya* obtained from WAD bucks was significantly higher than 5.70 % and 5.29% for Sahel and RS bucks, respectively. In the overall acceptability analysis, s*uya* prepared from both Sahel (6.21 %) and RS (6.88 %) were most accepted. Report from this study indicated no significant differences in the *suya* flavour. This may probably be because of the inherent flavour in c*hevon* might have been influenced by the different spices and the ingredients uptake prior to cooking (Ippoushi, 2003).

However, tenderness differed across the breed, 6.53, 6.11 and 5.56 for Sahel, Red Sokoto and West African Dwarf bucks respectively. *Suya* from both RS and Sahel bucks had significantly a higher overall acceptability rating than WAD bucks. On the other hand, juiciness plays fundamental functions in meat consumption such as amount of moisture released during mastication and also in the flavour facilitated by saliva during chewing.

Proximate composition

The muscle samples for the chemical composition were obtained from the muscles that were thawed overnight at 4^{Oc} and separately minced in a machine and stored for the proximate composition determined using AOAC (2005) method. After 24 hours, each of the grounded samples were allowed to thaw and remixed with aliquots for the analysis. Following this, the

polythene bags containing the samples were left to equilibrate to the room temperature before they were opened. The samples were then analyzed for the moisture, crude protein, ether extract and ash content.

The proximate composition of *suya* produced from chevon of indigenous goat (bucks) breeds in Nigeria is shown in Table 4. There was no significance difference (P>0.05) in moisture contents among the treatments, however ash, crude protein, ether extract and crude fibre contents varied significantly across the breeds. The CP was higher in WAD (50.70 %) than (49.55 %) and (49.92 %) for Sahel and RS respectively. Both ether extract and ash were higher in WAD (15.94 %, 8.22 %) compared with 14.02 %, 7.13 % and 14.05 %, 7.00 % for Sahel and Red Sokoto bucks respectively.

The proximate composition represents the different nutrients levels from c*hevon-suya*. There was no observable differences in moisture contents of the various *suya* samples from the breeds of bucks, although a range of (22.7% - 23.8 %) from the study were similar to previous findings but significantly lower than that of (Apata *et al.*, 2013). This could probably be because of inclusion of suya ingredient which varied according the limitation of those studies. This will definitely induce certain level of weight variation in the final suya products. These low results might be due to effect of roasting on the *suya* sample and the resultant average weight losses of moisture during cooking. The CP contents on the other hand had a significantly higher value in *suya* from WAD bucks. This may be as a result of WAD bucks might have absorbed more of the *yaji* ingredients during roasting which could probably be a formation of more protein complexes on cooking as a result of more surfaces on chevon from WAD buck facilitated by high fat content as against that from the other two breeds. These ingredients could serve as precursor for the formation of useful protein molecules that complement the inherent amino acids constituents in the chevon, Elizabeth (1994). This was not so in the other breeds of RS and Sahel bucks.

Conclusion and Recommendations

The result from the study shows that suya could be prepared from other types including chevon rather than the conventional use of beef. It was observed that the taste panels rated suya from Sahel bucks as most accepted but in terms product yield especially as related to economic gain there was no variation across the products. Moreover, with respect to ingredients uptake, product WAD bucks elicited the highest uptake.

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Table 1: Percentage composition of *Suya* ingredients

Name of Spices and Additives	Scientific names	Percentage (%)
Groundnut cake powder	(*Arachis hypogea*)	52.00
Ginger	(*Zingiber offinale*)	5.00
Garlic	(*Allium sativum*)	1.00
Red Dried pepper	*(Capsicum annuum)*	21.00
White pepper	(*Piper nigrum*)	10.00
Curry	(*Murraya koenigii*)	5.00
Common salt	(*sodium chloride*)	1.50
Magi	(*Monosodium glutamate*)	2.50
Groundnut oil		2.00
Total		100.00

Source: Omojola *et al*., (2004)

* 5-10 mls of groundnut oil was added to each stick of meat during roasting.

Figure 1: Freshly prepared Suya samples

Table 2: Percentage yield and other parameters of freshly prepared *Suya*

	BREEDS				
Parameters (%)	**SB**	**WADB**	**RSB**	**SEM**	**P-value**
Weight of sticks	3.92	3.89	3.91	0.857	0.7656
Weight of meat	71.01[a]	57.32[b]	49.65[c]	0.0441	0.0001
Weight of sticked meat	74.93[a]	61.21[b]	53.56[c]	0.0338	0.0012
Weight of ingredients	10.10	10.02	9.87	0.6010	0.5687
Weight before roasting	85.03[a]	71.23[b]	62.43[b]	0.0044	0.0031
Weight after roasting	55.12[a]	43.31[b]	41.27[b]	0.0032	0.0430
Product yield	62.31	64.94	67.11	0.310	0.9945
Cooking loss	37.56[a]	33.66[b]	32.50[b]	0.296	0.0164

[a,b,c] means on the same row with similar super script are not significantly different (P > 0.05)
SB: Sahel Bucks
RSB: Red Sokoto Bucks
WADB: West African Dwarf Bucks

Table 3: Sensory evaluation of *Suya* produced from thigh muscle harvested from three indigenous goat (buck) breeds in Nigeria

	BREEDS				
Parameters (%)	**SB**	**WADB**	**RSB**	**SEM**	**P-value**
Flavour	5.59	5.94	5.72	0.0610	0.9953
Texture	6.76[a]	5.41[b]	6.72[a]	0.618	0.0164
Juiciness	5.70[b]	6.29[a]	5.29[b]	0.0489	0.0020
Tenderness	6.53[a]	5.56[c]	6.11[b]	0.0234	0.0022
Overall acceptability	6.21[b]	5.07[c]	6.88[a]	0.0413	0.0279

[a,b,c]: means within the same row with different superscripts differ significantly ($p<0.05$).
WADB: West African Dwarf Bucks
SB: Sahel Bucks
RSB: Red Sokoto Bucks

Table 4: Proximate composition of *Suya*

	BREEDS				
Parameters (%)	**SB**	**WADB**	**RSB**	**SEM**	**P-value**
Moisture	22.75	23.11	22.89	0.126	0.5435
Crude protein	49.55[b]	50.70[a]	49.92[b]	0.170	0.0023
Ether extract	14.02[b]	15.94[a]	14.05[b]	0.110	0.0020
Crude fibre	0.74[b]	0.60[c]	0.81[a]	0.120	0.0031
Ash	7.13[b]	8.22[a]	7.00[c]	0.210	0.0115

[a,b,c]: means with different superscripts in the same row differ significantly ($p<0.05$).
WADB: West African Dwarf Bucks
SB: Sahel Bucks
RSB: Red Sokoto Bucks