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Carcass and Meat Characteristics of Traditionally Managed Nigerian Yankasa and West African Dwarf Breeds of Sheep

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ABSTRACT

The carcass characteristics of Nigerian West African dwarf (WAD) and Yankasa breeds of sheep managed under traditional systems were compared. These two breeds were represented by six animals each with an average body weight of 18.97±0.36kg. The animals were slaughtered and carcass weight, yields, composition and sensory properties scores were recorded. Results indicated that breed primarily differed in carcass traits and retail cuts. Yankasa breed had a significant higher ($P<0.05$) empty body weight, cold carcass weight. Dressing percentage varied ($P<0.05$) from 46.38 and 48.60% for WAD and Yankasa breeds, respectively. The loin and leg cuts were statistically ($P>0.05$) ranked the same across the two breed. Weights of the head and empty gut were significantly ($P<0.05$) lower in WAD sheep compared with Yankasa sheep. The crude protein and fat contents of meat from loins were higher ($P<0.05$) in WAD sheep. Following assessment, eating quality traits varied across breeds, panellist-rated flavour, juiciness and overall acceptability higher ($P<0.05$) in WAD meat. In conclusion, Yankasa sheep have a better carcass and dressing percentage but the overall sensory is better for the West African Dwarf. These may be due to the higher fat and protein contents resulted in more flavour, tender and juicy meat.

Keywords: Sheep, Yankasa, West African Dwarf, traditional management, carcass, sensory

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INTRODUCTION

In Nigeria, sheep is reared traditionally at subsistence level. They are mostly managed semi-intensively; usually left to scavenge and cater for their own nourishment with domestic leftovers whose composition depends on the family menu that may constitute part of sheep's diet (Fasae *et al.,* 2012). These animals are mostly reared for meat and are also important sources of milk, skins and manure. Their fecundity, short generation interval and capability for fitting into all existing agricultural production systems, as well as the prevailing demand for mutton, place them in a unique position (Ozung *et al.,* 2011). Sheep production in south western Nigeria is centred on the Yankasa and West African dwarf breeds. Compared to other breeds found in Nigeria, these breeds of sheep are classified in the lightweight sheep category with slaughter weight range of 15-30 kg. An understanding of carcass characteristics and meat quality traits of these sheep breeds is important because of the butcher's expectation and consumer demand for superior quality meat with optimum food value as well as the importance of protein in human diet cannot be over-emphasized.

This paper compares the carcass characteristics, chemical composition, and sensory evaluation of two common Nigerian breeds of sheep (Yankasa and West African dwarf) managed under the semi intensive system.

MATERIALS AND METHODS

Research Location

The study was conducted in the Teaching and Research Farms and the meat processing laboratory of the Animal Production and Health Department, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.

Experimental Animals and Their Management

Twelve (12) rams made up of six (6) Yankasa and six (6) West African dwarf (WAD) breeds with age range of 18-24 months and an average weight of 18.97±0.36kg, and managed semi-intensively were sourced from smallholder sheep farmers in Odeda, the local government area of Ogun state in the southwest of Nigeria. The vegetation around the area of purchase is luxuriant with *Pennisetum purpureum* and *Panicum maximum*. Other species of grasses and legumes available are *Andropogon tectorum, Imperata cylindrica, Centrosema pubescens, Stylosanthes hamata, Calapogonium mucunoides, Pueraria phaseoloides* and *Gliricidia sepium.* The sheep move out to graze early in the morning and come back around 1700hrs in the afternoon when they are given crop residues and household wastes as supplement in sheds. A spring balance scale was used to measure the weight of the sheep at purchase while the dentition method (Abegaz & Awgichew, 2009) was used to ascertain the age of the animals. The animals were allocated to two treatment groups according to their respective breeds.

Slaughter and Carcass Dissection

Prior to the slaughtering processes, the animal were fasted for 20 hours with free access to water and slaughtered according to the local method by severing the jugular vein and the carotid arteries. After thorough bleeding, the hair was scalded from the skin using boiling water as described by

Fasae *et al.* (2011). Empty body weight was calculated by subtracting the weight of the gut content from the slaughter weight. The hot carcass weight was the weight after removing the head, feet and gastric intestinal tract within one hour of slaughter. The internal organs (kidney, liver, heart and spleen) were carefully excised and weighed. The cold carcass was the weight after 24 hours in a freezer at 4^{o}C. The carcasses were cut into retail parts (shoulder, rack, loin, legs, neck/breast, and shank/flank) and each part was weighed according to the method described by Adu and Brinckman (1981). The dressing percentage was calculated as the ratio of cold carcass weight to live weight in percentage.

Sensory Evaluation

In evaluating the sensory qualities, samples of meat from each group were collected from the loin area, cut into chops of an average weight of 150g and cooked in water at a temperature of 65^{o}C for 30 minutes in a pot using a gas cooker. They were then coded and the serving sequence was randomized. Ten panellists were trained in the assessment procedure two days prior to the evaluation and were subsequently required to masticate on a sample from each treatment and score it for flavour, tenderness, juiciness and overall degree of acceptability. Water was served to the panellist to rinse their mouths after scoring each sample to minimize flavour carry over.

The evaluators scored each sample on a nine (9) point hedonic scale (9 = like extremely enjoy; 1 = extremely disliked) (Pena *et al.,* 2009) for colour, juiciness, flavour, texture, tenderness. Overall acceptability was scored on a 3-point scale (1 = least acceptable; 2 = more acceptable and 3 = most acceptable) (Iwe, 2002). Cooking loss was determined as the difference between pre-cooked and post-cooked weights, divided by pre-cooked weight of meat and multiplied by 100.

For the chemical composition of the meat, about 50g of meat cuts from the loin was kept at -20^{o}C until required for chemical analysis. The crude protein, fat (ether extract) ash and DM contents were determined by using the Kjeldahl method, soxhlet extraction, oven drying and burning the samples in the electric furnace, respectively (AOAC, 1995).

STATISTICAL ANALYSIS

The data obtained were subjected to analysis using the T-test (SAS, 1999).

RESULTS AND DISCUSSION

The comparison of the carcass characteristics of Yankasa and WAD sheep is shown in Table 1. The results revealed that carcass components observed differed significantly ($P<0.05$) across the breeds with WAD sheep having significantly ($P<0.05$) lower values compared to Yankasa sheep. The higher carcass weight observed in Yankasa sheep could be attributed by the weight at slaughter, and this agrees with the findings of Lawrie (1998) that carcass composition is weight dependent and largely uninfluenced by age or nutritional regime.

The carcass yields of Yankasa and WAD sheep in this study are lower compared with those reported for some tropical sheep (Adu & Brinckman, 1981; Madhavi *et al.,* 2006; Kawas *et al.,* 2007). This could be as a result of breed differences in this study. The dressing percentage (DP) of Yankasa sheep (48.60%) was higher (P<0.05) than WAD sheep (46.38%). Meanwhile, DP observed for WAD sheep in this study is lower to those reported by Alkoriet *et al.* (2007) and Fasae *et al.* (2011) for the same breed of sheep under zero grazing. Moreover, DP obtained for Yankasa sheep in this study is lower than those earlier reports of Adu and Brinckman (1981) for Yankasa and crossbred sheep, which could be attributable to the breed, management system and nutrition. However, these values are comparable to 44% and 48% DP in Omani sheep (Mahgoub *et al.,* 2000) and crossbreds of Mexican Pelibuey with Rambouillet sheep (Guttierez *et al.,* 2005), respectively.

Regardless of the carcass weight, the distribution of non-carcass components seemed to be similar (P>0.05) across the two breeds with exception of the head and empty gut weights, which were significantly (P<0.05) lower in WAD than the Yankasa sheep. Higher values were obtained for the WAD sheep (Fasae *et al.,* 2011) and the relationships between the physical component of carcass cuts and whole carcass have been shown in several studies (El Karim *et al*., 1988; Cameron, 1992).

Table 2 shows the comparison of the weight and percentages of retail cuts from WAD and Yankasa sheep. The leg was not affected (P>0.05) by breed. The loin, neck/breast and shank/flank differed across the

TABLE 1
Carcass characteristics of Yankasa and West African dwarf sheep

Components	Yankasa sheep	West African Dwarf
Slaughtered weight (kg)	20.33[a] ± 0.41	17.83[b] ± 0.36
Empty body weight (kg)	17.87[a]± 0. 37	15.04[b] ± 0.29
Hot carcass weight (kg)	12.30[a] ± 0.44	10.39[b] ± 0.12
Cold carcass weight (kg)	9.88[a] ± 0.09	8.27[b] ± 0.08
Dressing percentage (%)	48.60[a] ± 0.77	46.38[b] ± 0.65
Non-carcass components (kg)		
Head	8.91[a] ± 0.02	7.37[b]± 0.32
Heart	0.56 ± 0.01	0.55 ± 0.03
Kidney	0.37± 0.21	0.33 ± 0.02
Lung/Trachea	1.16 ± 0.31	1.13 ± 0.03
Liver	1.27 ± 0.11	1.31± 0.04
Spleen	0.28 ± 0.03	0.33 ± 0.01
Testes	0.93 ± 0.05	0.89 ± 0.02
Empty gut	9.93[a]± 0.41	8.20[b]± 0.03
Drainable blood	6.72 ± 0.32	7.09 ± 0.11

[a,b] mean values in the same row with the same superscripts are not significantly different (P>0.05)

breeds with WAD sheep having significantly ($P<0.05$) lower values compared to Yankasa sheep. The leg and loin cuts of the experimental sheep were not affected ($P>0.05$) by breed, which corroborates with the findings of Reddy and Reddy (2001). The shank/flank and rack cuts of Yankasa sheep were significantly higher ($P<0.05$) than WAD sheep. Nonetheless, significant ($P>0.05$) difference was not observed in the distribution of meat and bone in the leg of the animals.

The fairly close meat to bone ratio of rams in this experiment is similar to those reported by Adu and Brinckman (1981), which is probably an indication of uniform rate of meat and bone deposition in the experimental rams. The bone in leg and loin cuts which contributed to 32% to 33% of the total weight across the breed are similar to the range reported by Adu and Brinckman (1981), but higher than 27 and 24% reported in Menz than Horro sheep, respectively (Ewnetu *et al.,* 2006).

The proximate composition of meat from loin collected from Yankasa and WAD sheep is shown in Table 3. There is no significant ($P>0.05$) difference observed in the dry matter (DM) contents suggesting that the DM of meat across the breeds is closely

TABLE 2
Mean weights (Kg) of retail cuts of Yankasa and West African dwarf sheep

Components (Kg)	Yankasa sheep	West African Dwarf
Leg	5.43 ± 0.06	5.98 ± 0.02
Loin	6.49 ± 0.07	6.32 ± 0.03
Shoulder	27.07 ± 0.10	26.39 ± 0.81
Rack	30.72^{a} ± 0.05	28.09^{b} ± 0.95
Neck/Breast	2.13 ± 0.03	1.99 ± 0.01
Shank/flank	3.56^{a} ± 0.05	2.39^{b} ± 0.03
Leg and loin cuts		
Total weight	2.13± 0.06	1.85± 0.05
Total meat	1.60± 0.04	1.40± 0.03
Total bone	0.53± 0.01	0.45± 0.01
Meat to bone ratio	0.33± 0.02	0.32± 0.01

^{a,b} Mean values in the same row with the same superscripts are not significantly different ($P>0.05$)

TABLE 3
Chemical composition (%) of meat from loin of Yankasa and West African dwarf sheep

Parameters	Yankasa	West African Dwarf
Dry matter	26.73 ± 1.72	27.22 ±1.69
Crude protein	33.50^{b}± 1.95	35.50^{a}±2.05
Fat	7.43^{b}± 0.11	10.20^{a} ± 0.16
Ash	4.12 ± 0.05	4.50 ± 0.06

$^{a, b}$ Means in the same row with the same superscripts are not significantly different ($P>0.05$).

related. In contrast, crude protein content ($P<0.05$) varied across the breeds. Also, WAD sheep had higher ($P<0.05$) fat content compared to Yankasa sheep, while the ash content was not affected ($P>0.05$) by breed.

Table 4 shows the mean values of the sensory properties of Yankasa and WAD sheep. Following sensory assessment, there were significant differences ($P<0.05$) observed for eating quality traits. The panellists rated meat from WAD sheep higher ($P<0.05$) in flavour juiciness, tenderness and overall acceptability ($P<0.05$) relative to that of Yankasa meat. This corroborates the findings by Schönfeldt *et al.* (1993) that reported with increasing fatness of carcasses, the tenderness and flavour of the cooked cuts of sheep meat increased significantly. Also, research reports show that flavour ratings appear to be largely related to the panellist's preference and previous exposure to lamb (Sanudo *et al*., 2000). Risvik (1994) indicated that texture and juicy meat is generally preferred by consumers. Moreover, there is a perfect relationship in meat colour from both breeds as rated by the panellists.

CONCLUSION

Based on the results of this study, it could be concluded that Yankasa and West African Dwarf breeds of sheep are to be more considered as being important sources of animal protein. The Yankasa sheep have better carcass and dressing percentages but the overall sensory was better for the West African Dwarf. This may be due to the higher fat and protein contents resulted in more flavour, tender and juicy meat. It is therefore suggested that an improvement in nutrition and breeding programmes of these traditionally managed sheep may possibly produce well-conformed and heavier carcasses, with no apparent detrimental effects on the carcasses quality in the breeds studied.

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TABLE 4
Effect of breed on the sensory properties of meat from loin of Yankasa and West African dwarf sheep

Parameters	Yankasa	West African Dwarf
Flavour	$6.50^b \pm 0.24$	$7.38^a \pm 0.31$
Tenderness	$6.50^b \pm 0.29$	$7.25^a \pm 0.34$
Texture	7.00 ± 0.31	7.25 ± 0.28
Colour	7.50 ± 0.43	7.50 ± 0.43
Juiciness	$6.75^b \pm 0.32$	$7.25^a \pm 0.33$
Acceptability	$7.63^b \pm 0.47$	$8.00^a \pm 0.42$

^{a,b} Means in the same row with the same superscripts are not significantly different ($P>0.05$).

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