CATTLE (SOKOTO GUDALI, WHITE FUMANI AND RED BORORO) SHOULDER MUSCLES EVALUATION.

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ABSTRACT

Effect of meat quality from composition of different muscle or breeds is a food for thought. Do muscles from same breed differ in chemical and mineral composition? Or different taste preference to consumers? This study evaluates the composition of different shoulder muscles from three breeds of cattle and the different muscles within their shoulder. Nine male cattle of one-year-old, comprising of 3 Sokoto Gudali (SG), 3 White Fulani (WF) and 3 Red Bororo (RB) breeds were reared semi – intensively, fed with concentrate and allowed to graze for 10 weeks. Shoulder muscles evaluated are; Triceps brachi – TB, Trapezius – T, Infraspinatus – IF, Supraspinatus – S, Pectoralis – P, Latissimus dorsi – LAD and Longissimus dorsi – LOD, for proximate, minerals and palatability status, in a completely randomized design. SG had the highest nutritional quality especially in CP, Ash, Mg Fe and P with lowest amount of ether extract (P<0.05) than WF and RB. IF muscles performed better from all the other shoulder muscle evaluated (P<0.05). Physico-chemical evolution had highest WHC (P<0.05) in SG (497.29%) than WF (456.01%) and RB (490.77%). Same was experienced with IF muscle compared with other muscle evaluated. SG had the highest values (P<0.05) for flavour (6.01), tenderness (6.10), juiceness (5.91), texture (5.86) and overall acceptability (6.39) than values obtained for WF and RB. SG appeared to be the best breed while IF performed well in shoulder muscles of cattle evaluated.

Keywords: Breeds of cattle, Red Bororo, White Fulani, Sokoto Gudali and Shoulder muscles.

INTRODUCTION

Most African countries have major problems of malnutrition in certain sectors of their population. FAO (2009) recorded that the diet of an average Nigerian contains about 20% less than the recommended requirement. Protein intake is very low, mostly from vegetable sources which contains little or no protein and meat is the antidote of malnutrition. Consumers purchase meat and process them into desirable products without full knowledge on the breeds, type of muscles or nutritional values they might get from the product bought (Fakolade *et al*., 2018). Animal breeds can influence the nutritive qualities of meat in some ways, which could affect the muscles structure and meat physiology. Steven Jones (2018) recorded major muscles in the shoulder which are: Longissimus dorsi, Triceps brachii, Infraspinatus, Supraspinatus, Trapezius, Latissimus dorsi and Pectoralis muscle. The characteristics possessed by each will dictate differences in meat quality produced from different shoulder muscles. Therefore, this study will access shoulder muscles from three breeds of cattle and differences in muscles of cattle shoulder.

MATERIALS AND METHOD

Experimental Animals

Nine male live animals of a year old, comprising of 3 White Fulani, 3 Sokoto Gudali and 3 Red Bororo were purchased from Osun State University Teaching and Research Farm. Thereafter, the cattle were quarantined, dewormed, given anti – stress and antibiotics. The animals were raised under a semi – intensive housing system for ten weeks and tagged for easy identification (White Fulani – WF, Sokoto Gudali – SG and Red Bororo – RB). Immediately after exsanguination, skinning took place (removal of animal's skin) in order to access and identify muscles in the shoulder for experimental study.

Identification of muscles in the shoulder

The muscles obtained were identified in the Meat Science Laboratory as Triceps brachii – TB, Trapezius – T, Infraspinatus – IF, Suspraspinatus – S, Pectoralis – P, Latissimus dorsi – LAD and Longissimus dorsi – LOD.

Proximate and Mineral Composition

Protein, ether extract, moisture contents and ash composition and Calcium, Phosphorus and Magnesium were analysed chemically according to the Official Analytical Chemist (AOAC, 18TH EDITION, 2005).

Physico – chemical evaluations

Water Holding Capacity

The WHC of meat samples was determined by the press method as slightly modified by Suzuki *et al*., (1991). Using the calculation below:

$$WHC = \frac{\{(Aw - Am \times 9.47)\}}{Wm - Mo}$$

Where, Aw = Area of water released from meat samples (cm^2)
Am = Area of meat samples (cm^2)
Wm = Weight of meat samples (%)
Mo = Moisture content of meat samples (%)
9.47 = a constant factor

Cold Shortening and Thermal Shortening

Meat samples of known weight and length were stored in refrigerator for 24h at 4^0C for cold shortening, or broiled in an oven for thermal shortening (Fakolade *et al*., 2016). After refrigeration, the final length was taken and calculated thus

$$\text{Cold shortening (\%)} = \frac{\text{Initial length of meat} - \text{length of frozen meat}}{\text{Initial length of meat}} \times 100$$

Cooking Loss and Thaw Rigor

Meat samples of known length and weight were taken and broiled in an oven at 175^0C for 20mins (Fakolade *et al*., 2016). Afterwards, the final weight was taken and calculated thus:

$$\text{Cooking loss (\%)} = \frac{\text{Initial weight of meat} - \text{weight of broiled meat}}{\text{Initial weight of meat}} \times 100$$

Palatability

A total number of forty trained panellists aged 27 to 45 years were selected based on their past performance in consuming meat and were randomly allocated to the samples. Each panellists was presented the blind coded samples and asked to score each sample for flavour, tenderness, juiciness, colour and overall acceptability (Fakolade *et al*., 2016).

Statistical Analysis

The experimental design adopted was complete randomized design (CRD). All data were subjected to analysis of variance (ANOVA) and means were separated with Tukey HSD using the same analytical software.

RESULTS AND DISCUSSION

Table 1: Proximate and mineral composition of SG, WF and RB cattle shoulder

Variables	SG	WF	RB	SEM
CP	21.33^a	20.73^b	20.85^b	0.20
Ash	0.97^a	0.92^b	0.90^b	0.10
Ether extract	3.28^b	3.47^a	3.45^a	0.23
Moisture Content	74.52^a	74.27^a	73.66^b	0.19
Magnesium	84.45^a	82.14^c	83.19^b	0.06
Iron	22.84^a	20.31^b	22.95^a	0.05
Phosphorus	276.52^a	266.86^b	265.23^b	0.16

^{abc}: mean within the same row with different superscripts are significantly different (P<0.05)

Table 2: Proximate and mineral composition of different muscles of cattle shoulder

Variables	TB	T	IF	S	P	LAD	LOD	SEM
CP	22.48^a	19.98^c	21.24^{ab}	20.57^b	21.37^b	21.12^{ab}	19.02^c	0.31
Ash	0.90^b	0.99^a	0.95^a	0.92^b	0.87^c	0.92^b	0.96^a	0.02

Ether extract	3.74^{a}	3.32^{c}	3.55^{b}	3.47^{b}	3.25^{c}	3.15^{d}	3.32^{c}	0.04
Moisture content	71.33^{c}	74.52^{a}	75.76^{a}	74.89^{a}	75.12^{a}	73.67^{b}	73.72^{b}	0.29
Magnesium	83.56^{a}	83.91^{a}	83.78^{a}	82.82^{b}	84.34^{a}	83.12^{a}	82.99^{c}	0.10
Iron	22.49^{a}	21.95^{a}	21.97^{a}	22.48^{a}	20.53^{b}	22.65^{a}	22.18^{a}	0.07
Phosphorus	272.35^{a}	270.00^{a}	274.05^{a}	276.01^{a}	261.33^{b}	269.89^{b}	263.13b^{e}	0.24

^{abcdef}: mean within the same row with different superscript are significantly different (P<0.05)

Table 3: Physico – chemical status of shoulder muscles of SG, WF and RB cattle

Variables	SG	WF	RB	SEM
Thermal shortening	41.86^{c}	53.10^{a}	46.32^{b}	2.35
Cooking Loss	67.34^{c}	75.88^{a}	71.81^{b}	2.32
Cold shortening	21.98^{b}	41.42^{a}	22.72^{b}	0.84
Thaw Rigor	35.10^{b}	61.34^{a}	34.70^{b}	2.24
Water holding capacity	497.29^{a}	456.01^{b}	490.77^{b}	39.75

^{abc}: mean within the same row with different superscript are significantly different (P<0.05)

Table 4: Physico – chemical status of different muscles in cattle shoulder

Variables	TB	T	IF	S	P	LAD	LOD	SEM
Thermal hortening	44.17^{c}	44.68^{c}	43.10^{d}	48.89^{b}	56.96^{a}	44.26^{c}	47.58^{b}	3.60
Cooking loss	77.31^{a}	69.45^{c}	69.68^{c}	69.57^{b}	73.34^{b}	74.50^{b}	71.90^{c}	3.54
Cold shortening	36.16^{c}	21.02^{d}	30.15^{c}	23.99^{c}	23.99^{d}	32.39^{b}	33.48^{b}	1.28
Thaw Rigor	43.75^{c}	46.11^{b}	43.96^{b}	36.49^{d}	36.49^{d}	43.82^{b}	55.04^{a}	3.42
WHC	471.90^{c}	549.14^{b}	638.93^{a}	546.18^{b}	457.05^{c}	420.76^{c}	245.52^{d}	60.7

^{abcd}: mean within the same row with different superscript are significantly different (P<0.05)

Table 5: Palatability status of SG, WF and RB shoulder muscle.

Variables	SG	WF	RB	SEM
Colour	5.08^{b}	5.44^{a}	5.04^{b}	0.21
Flavour	5.01^{b}	4.43^{c}	5.58^{a}	0.18
Tenderness	6.10^{a}	5.86^{b}	5.70^{b}	0.19
Juiciness	5.91^{a}	5.18^{c}	5.66^{b}	0.17
Texture	5.86^{a}	4.19^{b}	5.99^{a}	0.19
Acceptability	6.39^{a}	5.74^{b}	5.88^{b}	0.18

^{abc}: mean within the same row with different superscript are significantly different (P<0.05)

Table 6: Palatability scores of different muscles in cattle shoulder

Variables	TB	T	IF	S	P	LAD	LOD	SEM
Colour	5.50^{b}	4.61^{c}	5.19^{b}	5.97^{a}	4.94^{c}	4.97^{c}	5.11^{bc}	0.33
Flavour	4.94^{b}	4.39^{c}	5.53^{a}	5.53^{a}	4.81^{b}	4.94^{b}	4.92^{b}	0.28
Tenderness	6.77^{a}	5.08^{d}	6.67^{a}	6.19^{ab}	5.94^{b}	5.67^{b}	5.42^{c}	0.29
Juiciness	5.92^{b}	5.14^{c}	5.94^{b}	7.06^{a}	5.28^{c}	4.53^{d}	5.19^{c}	0.25
Texture	5.86^{b}	4.89^{d}	5.47^{c}	6.67^{a}	5.39^{c}	5.44^{c}	5.36^{c}	0.29
Acceptability	6.14^{b}	6.11^{b}	6.78^{a}	6.22^{b}	5.86^{ab}	6.06^{b}	5.78^{c}	0.28

^{abcd}: mean within the same row with different superscript are significantly different (P<0.05)

The shoulder muscle of SG gave the best ($p < 0.05$) composition values for CP. Values obtained corroborates the findings of Adeniyi *et al*., (2011) with beef protein ranges from 18 – 22 %, moisture 68 to 75 % and 2 to 15 % who worked on proximate composition and economic values of four common sources of animal protein. Ether extract obtained was in agreement with the report of Tonberg (2005) who evaluated the effect of heat on meat protein. SG shoulder muscle had the best nutrient qualities breeds. Infraspinatus IF muscles of cattle shoulder performed best in the proximate and minerals composition evaluated having the highest ($p < 0.05$) values in Ash, minerals composition and lowest percentages in Ether extract.

Kim *et al*., (2008) obtained a low fat values as in Table 2, TB (3.44%), IF (3.55%), S (5.35%) which is also fell within the range obtained, this could only indicate that shoulder muscle are lean. IF appeared best for proximate analysis, while TB, T, and LAD had significant values ($P < 0.05$) in minerals composition, Protein content for TB 22.48 % corresponds with 22.13 % obtained by FAO (2009) for longissimus dorsi of cattle meat. WF has the highest values in all parameters evaluated for physico-chemical except in WHC, this indicates that most of the nutrients of the meat are lost during processing therefore, WF has a poor meat quality since it cannot retain water and nutrients while SG proved to be the best. Kauffman (1992) reported that, higher thaw rigor reduces juiciness, texture and nutrient in meat. IF muscle had the highest WHC and considerably low in other parameters evaluated. Parameters like thermal, cooking loss, cold shortening and thaw rigor affect quality of meat if it is ($P > 0.05$) higher, could affect the organoleptic properties of the consumers, as there will be reduction in the nutrients of the meat (Fakolade *et al*., 2018).

SG was most acceptable by the panellist since it had the highest ($P > 0.05$) flavour, tenderness, juiceness and texture, which influences its acceptability more over WF and RB. This results could be due to high protein and mineral content of SG.

In Table 6, panellists gave IF the higher score probably because its muscle was able to retain water and nutrients than every other muscles evaluated and because it had the highest proximate and mineral composition, which in turn may have influenced the organoleptic properties of the panellists.

CONCLUSION

SG breed of cattle and IF proved to be the best quality breed of cattle and muscle with best nutritional qualities than the other breeds or muscles evaluated.

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