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Performance and Carcass Characteristics of Four Breeds of Rams in Nigeria under Fattening Condition

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Abstract

The constraints to large scale production in the developing countries are non-identification of fast- growing breeds and unavailability of adequate feed. It is therefore necessary to explore all possible avenues to adequately increase meat production for human consumption through assessing the performance of the local breeds of rams. Four breeds of rams: Balami (BM), Uda (UD), Yankasa (YKS) and West African Dwarf (WAD), a total of forty-eight rams, consisting of twelve rams per breed, with average weight of 17-19kg, were fed with energy based diet of 2.77Mcal/kg Metabolizable Energy for ninety days. The Average Daily Weight Gain (ADWG) was determined. Eight rams per breed were randomly selected and sacrificed to determine the Dressing Percentage and Rib Eye Area (REA). Data were analysed using Descriptive and ANOVA α 0.05. The ADWG (g) of BM, UD, YKS and WAD were 210.00±0.01, 200.00±0.01, 180.00±0.02 and 160.00±0.03, respectively. The DP (%) of the breeds was 51.5±2.06, 52.36±1.44, 52.25±2.02 and 552.80±2.62 for BM, UD, YKS and WAD, respectively. The REA (inch^2) of BM (2.75±0.01) was higher than UD (2.33±0.02), YKS (2.03±0.01) and WAD (1.43±0.02). The results of the study showed that Balami breed had the best potential for perfofmance and carcass characteristics.

Keywords: Ram, breed, fattening, rib-eye-area, water holding capacity

Introduction

Fattening of rams in a feedlot is one of the best options of increasing animal protein supply. Good feeding advances average daily gain and feed efficiency as protein and energy levels in the diet are increased (Ebrahimi *et al*., 2007). Ram fattening is done to increase carcass yield by 30-40% during a short period on a high level of nutrition which is usually made up of high energy concentrates (Iwuanyanwu, 2001). Studies on the productivity of indigenous breeds under improved conditions can be helpful for better evaluation of their potentialities as different breeds react differently to feed (Maiga, 1974). Carcass composition of various breeds differs considerably in terms of carcass weight, percentages of fat, muscle and bone. However, little information is available on the performance and carcass characteristics of the breeds of rams in Nigeria.

Therefore, this study focused on the influence of Nigerian breeds of ram fattened under the same management on yield of carcass.

Materials and Methods

Animals and management: A total of forty-eight (12 –18 months) rams comprising of twelve each of BM, UD, YKS and WAD were procured from sheep and goat market located within the study area. Breed identification was based on the classical phenotypic features described by Mason (1988). The rams were distributed into four treatment groups based on breed and each treatment was replicated twelve times in a completely randomized block design. The rams were ear tagged and kept in a separate pen equipped with watering and feeding facilities throughout the ninety days of feeding trials.

Feeds and feeding: The animals had *ad libitum* access to a concentrate mix formulated as shown in table 1. The animals were fed at the rate of 5.0 % of their respective body weight on daily basis. Feed intake was determined daily as the difference between feed offered and refusals.

Slaughtering: At the end of the 90 days of fattening, eight rams in each breed were chosen for subsequent carcass analysis. All the rams were slaughtered after a 16 h fast in the experimental slaughter house of the department of Animal Science, University of Ibadan, Nigeria. Slaughtering was performed according to Muslim practice without stunning. The head was removed at atlanto-occipital articulation. This was followed by skinning, evisceration and weighing of viscera organs using an electronic scale (Cuisinart KML-K03BV36246-China). The hot carcass was weighed and the dressing percentage calculated as;

$$\text{Dressing Percent} = \frac{\text{Hot carcass weight}}{\text{Live weight}} \times 100$$

The carcasses were chilled for 24 hours at 4^{o}C, the cold carcasses were weighed and the chilling loss calculated as;

Chilling loss = Weight of carcass before chilling – weight of carcass after chilling x 100
Weight of carcass before chilling

The carcasses were split down the dorsal midline. The left side of each carcass was weighed and cut into primal cuts according to the specification of the Meat and Livestock Commission (1976). Muscle, bone and fat components of each primal cut were determined by physical dissection and weighed separately.

Table 1: Ingredients and chemical composition of the experimental feed

Ingredients (g/100g)	Concentrate	Hay
Dusa*	30.38	—–
Brewer's dried grain	29.38	—–
Cassava peel meal	5.69	—–
Wheat offal	19.56	—–
Palm kernel meal	10.00	—–
Di-calcium phosphate	3.00	—–
Sodium chloride	1.00	—–
Premix	1.00	—–
Total	100	—–
Components (g/100g)		
Dry matter	88.05	91.40
ME (MCal/Kg)**	2.77	1.80
Crude protein	11.95	9.15
Ash	4.80	4.00
Ether extract	4.50	0.90
Crude fibre	11.75	18.65
Acid detergent lignin	9.89	15.20
Acid detergent fibre	35.20	49.01
Neutral detergent fibre	53.50	68.70
Cellulose	25.31	53.50
Hemi-cellulose	18.03	19.96

**By-product of local gin factory
*ME calculated from feed composition Table

Physical evaluation: *Water Holding Capacity (WHC).* WHC was determined by the press method described by Wierbicki and Deatherage (1958) as modified by Tsai and Ockerman (1981). *Cooking Loss*. Meat sample (50 g) was placed in tightly sealed polyethylene oven bag and heated in a water bath at 75°C until an internal temperature of 72°C was achieved. Cooking loss was expressed as the percentage loss related to the initial weight.

Cooking loss = Weight of sample before cooking- Weight of sample after cooking x100
Weight of sample before cooking

Shear Force (Kg/cm³): Measurement for shear force value as indication of meat tenderness was carried out using Warner-Bratzler Shear force (WBSF) apparatus according to Honikel, 1998.

Statistical analysis: Data was analyzed by the analysis of variance using the general linear model procedure of SAS (2001).

Results and Discussion

The chemical composition of the experimental feedstuff is given in table 1. The CP content of the hay was higher than the range of 7 - 7.5 which was reported as sufficient level for maintenance and rumen microbial function (Van Soests, 1994). Data on the fattening performances of different breeds of rams are summarized in table 2. Results of the fattening experiments have shown that rams of the native breeds have quite satisfactory fattening performance. Average daily weight gain and total weight gain during the trial were 269 ± 0.01 g and 24.21 ± 0.48 kg in Balami ram, 197 ± 0.01 g and 17.72 ± 0.48 kg in Uda, 161 ± 0.01 g and 14.50 ± 0.48 kg in Yankasa and 179± 0.01 g and 16.12± 0.48 kg respectively. The results of this study proved the genetic potential of each of the breeds during fattening. Average daily weight gain (ADG) was more ($p< 0.05$) pronounced in Balami (269 g/day) and Uda (197 g/day) compared to Yankasa (161 g/day) and WAD (179 g/day). In this study, the finding obtained for average daily weight gain of Balami rams were similar to values obtained in previous reports on the rams of other

breeds Sen *et al.* (2011). It must however be noted that the growth rates reported in this study are unlikely to be achieved under natural grazing system and the fattening period would have taken extended period of time. The values of FCR approximating 5.10 to 3.13 could indicate a relative good feeding level with experimental ration even with high proportion of basal diet.

Dressing percentage is a trait of economic importance, the higher the dressing percentage the better terms of economic returns (Omojola, 2007). Slaughter and carcass characteristics of rams are presented in table 3. The highest dressing percentage (including fat tail) in warm condition was 54.59 ± 0.69% in Balami ram and when compared with Uda ram 52.36 ± 0.69%, Yankasa ram 52.25± 0.69% and WAD breeds 52.80 ± 0.69, no significant difference was found. The similarities in both results could be attributed to fattening condition. WHC is an important property of fresh meat as it affects both the yield and the quality of the end products. WHC was 77.87±4.10% for Balami, 74.22±2.56% for Uda, 72.19±3.54% for Yankasa and 72.60±3.62% for WAD samples, all of which were significantly different from one another. The rib-eye area increased proportionately as the slaughter weight increased with Balami having the highest ($p<0.05$) value while the WAD had the least.

Table 2: Carcass characteristics and Physical properties of mutton of four breeds of rams intensively fattened

Parameters	Balami	Uda	Yankasa	WAD
Number of Rams	12	12	12	12
Water Holding Capacity %	77.87±4.10^{a}	74.22±2.56^{b}	72.19±3.54^{b}	72.60±3.62^{b}
Cooking Loss %	22.13±0.88^{b}	25.79±2.55^{a}	27.81±3.54^{a}	27.40±3.60^{a}
Specific Gravity	0.88±0.01^{b}	0.86±0.44^{c}	0.88±0.05^{b}	0.94±0.03^{a}
Shear Force (kg/cm^2)	3.67±0.76^{b}	2.71±0.85^{c}	4.46±0.31^{a}	3.47±0.67^{b}
Chilling Loss (%)	3.04±0.11	3.07±0.16	2.76±0.35	2.43±0.61
Dressing Percentage (%)	54.59±2.06	52.36±1.44	52.25±2.02	52.80±2.62

^{abc}:Means in the same row with similar superscript are not significant ($p>0.05$)

According to the results of meat tenderness measurement, meat samples obtained for Uda (2.71±0.85) was most tender than those of Balami (3.67±0.76), Yankasa (4.46±0.31) and West African Dwarf (3.47±0.67kg/cm^2) rams. However, meat tested by shear force measurement with values exceeding 5.5kg/cm^3 are considered tough by consumers (Shackelford *et al*.,1991). Therefore, shear force values obtained from this study suggested that mutton has a highly acceptable degree of tenderness (Burke and Apple, 2007). Cooking loss is considered as the most important technological properties from the economic point of view, it reflects the WHC and meat products as reflected in Table 4 . A reduced cooking loss means less water is expelled for the muscle tissues, which might suggest that meat from Balami is more juicy than other breeds of rams in this study. This could also be linked with the increased volume of myofibril characteristics in meat which varies with breeds leads to higher WHC (Keolezak *et al*., 2007).

Table 3: Tissue distribution in the carcasses of four breeds of rams intensively fattened

Parameters (%)	Balami	Uda	Yankasa	WAD
Number of Rams	12	12	12	12
Lean Meat	75.77±0.01^{a}	72.01±1.75^{ab}	66.08±2.57^{c}	67.68±7.70^{bc}
Bone	13.74±0.04^{b}	16.59±1.32^{a}	18.98±0.90^{a}	18.07±1.80^{a}
Fat	7.42±0.01^{b}	8.22±0.69^{b}	12.87±1.91^{a}	13.10±1.60^{c}
Losses	2.81±0.01^{b}	2.72±0.46^{b}	3.46±1.32^{a}	1.89±0.47^{b}
Lean : Bone	5.52±0.01^{a}	4.36±0.43^{b}	3.47±0.15^{c}	3.80±0.78^{bc}
Lean : Fat	10.22±0.11^{a}	8.78±0.41^{a}	5.30±0.79^{b}	5.34±1.44^{b}

^{abc}:Means in the same row with similar superscript are not significant ($p>0.05$)

The values of lean meat, bone and fat tissues for Balami rams were 75.77±0.01, 13.74±0.04 7.42±0.01 and 72.01±1.75; 16.59±1.32 and 8.22±0.69 Uda, respectively. While the corresponding values for Yankasa and WAD breeds of rams were 66.08±2.57 and 18.98±0.90; 12.87±1.91 and 67.68±7.70; 18.07±1.80 and 13.10±1.60%, respectively. The meat bone ratio; lean meat fat ratio as determined by dissection of the carcass were 5.52±0.01: 10.22±011 and 4.36±0.43: 8.77±0.41 in Balami and Uda breeds of rams, respectively and the corresponding ratio for Yankasa and WAD breeds of rams were 3.47±0.15: 5.30 and 3.80±0.79: 5.34±1.44, respectively. However, the difference between the four genetic groups was significant. Slaughter weight is the main factor influencing carcass composition (Mahgoub *et al*., 2005). The description of the meat potential can be done through the muscle/bone ratio.

Conclusion

Among all the four selected breeds, Uda and Balami breeds were heaviest on live-weight basis and better dressing percentage. Therefore, fattening of rams can increase body weight and raise the condition score of local rams in order to fetch a better market price.

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