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GROWTH PERFORMANCE AND MUTTON QUALITY OF FATTENED NIGERIAN INDIGENOUS RAM BREEDS

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ABSTRACT

Identification of sheep breed suitable for fattening among available breed in Nigeria to increase productivity is of essence. To this effect, twenty-four (24) male lambs: six each of Uda rams (UDA), West African Dwarf (WAD), Balami (BAL) and Yankassa rams (YAK) with average weight of 23.94kg were fattened for a period of 90 days in the Livestock Section of the Farming Systems Research Programme of the National Cereals Research Institute, Badeggi, Bida, Nigeria. Prior to the trial, the rams were dewormed, sprayed against ticks and other ectoparasites and vaccinated against some diseases and were fed iso-calorie diets (2.20Mcal/Kg) ad libitum in a confinement. The animals also had access to clean water and salt lick on free choice basis. Final Body Weight (FBW) and Feed Conversion Ratio (FCR) were measured using standard procedures. Three animals per breed were thereafter sacrificed to compare the relative percentage proportions of bled weight, Empty Body Weight (EBW), Hot Carcass Weight (HCW) and the Dressing Percentages (DP). Also, evaluated were Lean-Meat Yield (LMY), Meat to Bone Ratio (MBR) and Total Fat Deposit (TFD) in a Completely Randomised Design (CRD). The FBW (kg) of 40.08 and 38.78 for UDA and WAD were similar but significantly lower than 48.77 and 44.14 for BAL and Yak rams respectively. Also, FCR of 11.14, 9.87 and 11.64 obtained for UDA, WAD and YAK rams were significantly higher than 8.89 obtained for BAL rams. Even though all the rams elicited different DPs, no significant differences were observed across treatment groups. However, TFD of 12.63 in BAL rams was significantly higher than 10.87, 10.02 and 10.11 in UDA, YAK and WAD rams respectively. The study concluded that BAL rams had faster growth, yielded more mutton and had highest TDF, suggesting that Balami rams will thrive well among the sheep breeds if intensively fattened with 2.2Mcal/KgDM under a good management condition.

Keywords: Growth performance, Fattening, sheep breeds, carcass quality, mutton yield

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INTRODUCTION

Animal protein is an important component of human diet necessary because of its quality nutritional value and optimal influence on the performance of human being (Day *et al*., 2022). Meat alongside milk, egg and fish are the chief sources of animal protein but of all the four, meat is the most preferred and beef is the most accepted, Aduku *et al*, (1990). Cow meat is highly nutritious contributing most quality protein, essential minerals and trace elements with wide range of vitamins needed for optimal performance of the body (Buckley *et al.*,

1995). The high demand for protein especially meat due to the ever growing population coupled with astronomical increase in cost of livestock feeds has made it less accessible to vast majority of individuals. This has put serious pressure on government across the world and more importantly on the major stakeholders in food production industry (Ayanniyi, 2018). Hence, there is call for improved research findings to arrest this trend, and thereby make meat available to average low income earners. Incidentally the current economic reality in the country has constrained the livestock industry in meeting these obligations. Therefore, there is the need to look for means to argument the meat short fall to meet the demand of the ever increasing population. However, sheep production enterprise offers a good window of opportunity to ameliorate the situation due to the fact that they contribute more to food production, rural employment and gross domestic product of the country (Abdel-Baset, 2009).

Sheep were first domesticated in Central Asian for more than 5000 years and have been the source of protein needs for early farmers. Sheep are said to have been contributing significantly to world economy, (FAO, 1990). There are also reports that heavier carcasses were found in rams over that of bucks especially when both were put in an intensively managed feeding system (Monson, *et al*., 2004). It was believed that sheep and goat after dog production is man's oldest organised industry and its domestication was largely based on its potentials to provide wool and skin for clothing, meat and milk for man and his family and also manure to enrich soil fertility (Zygoyiannis, 2006). They are particularly important tool in the development of rural economy as report has it that more than 5 million families engaged in various value chain activities in the small ruminant animal sector of the livestock industry (FAO, 1990). Nigeria has the largest small ruminant herd in Africa followed by Sudan, Chad, Ethiopia and Kenya with about 73.8 million goats and 42.1 million Sheep (NASS 2011). In recent time however, Abubakar (2022) reported estimated population of sheep in Nigeria to be 53,061,143 which makes sheep the second most important species in the country after goats.

One of the fundamental principles in increasing the meat yield in ruminant animals' production is fattening. It is a process where proven weaners are fed with the aim of increasing the yield of edible carcass by 30-40% within a short period. Fattening of sheep is a common practice among the low income farmers to provide solution to the less availability of meat protein. Four main indigenous breeds of sheep are known in Nigeria. They include West African Dwarf (WAD) sheep, Uda, Yankassa and Balami. Balami is assumed to be most predominant in the North-Eastern Nigeria with some pockets found in some North-Western States. Even though, this need to be scientifically proved but findings from early workers collaborated it as affirmed by Adu *et al., (*1979). They are predominantly white and hairy breed with a pronounced convex heat and a dull depression. The Uda is also hairy type with distinctive markings. The front half of the body may be black or brown and the back half is white. They have the ability to survive in any dry or hot environment. Yankassa breed is widely distributed in most Nigeria states (Anurudu, 2011). They are medium to big size. WAD sheep are found in Southern part of Nigeria (rainforest ecology). They are trypanotolerant, small size, and short legs with short tails. The animals thrive on poor quality diets such as grass, crop residues and left over and yet yield good quality meat besides serving as sources of cash income during festive and religious occasions, (Berhanu and Aynalem, 2009). Sheep

thereby becomes a possible option as it could also produce more and quality meat if managed in an improved intensive system.

However, information on the quality attributes of mutton from fattened indigenous sheep breeds in Nigeria is scanty, therefore the yield proportions of mutton and its quality attributes from fattened ram breeds were evaluated.

MATERIALS AND METHODS

Location of the Experiment

The study was carried out at the Sheep and Goats Unit, Livestock Section of the Farming Systems Research Programme of the National Cereals Research Institute, Badeggi, Bida. Niger State, Nigeria. The rams were managed for a 90-day fattening period. They were later moved to the abattoir section for slaughter, carcass dressing and packaging. The mutton analysis was done in the Institute Laboratory. The area is located on Latitudes 9 08^0N and 6 009^0E and is characterized by humid climate, warm and partly cloudy dry season.

Animal Management

Twenty-four (24) lambs consisting of 6 each of West African Dwarf rams, Uda, Yankassa and Balami averagely weighing between 23.01 kg with an average age of 14-16 months were used for the study. They were purchased from Wuya market, Bida Local Government Area of Niger State. Familiar stocks were put in a pen without compromising the breed differences and influence on the other.

Prior to the trial, the rams were dewormed, sprayed against ticks and other ectoparasites and vaccinated against some diseases. The animals were fed isocaloric diet of 2.20Mcal/Kg and were given improved hays once daily all in a Completely Randomized Design (CRD). The animals were fed 5% of their respective body weights. Concentrates were fed twice with roughages in between in a ratio 60:40. Each ram was neck tagged and managed in separately equipped pens with watering and feeding assets throughout the ninety days feeding trial. Salt lick and clean water were provided on free choice basis.

Table 1: Ingredient composition of concentrate feed on % dry matter basis

Ingredients	Percentage (%)
Dusa*	30.88
Brewer's dried grain	29.80
Peeled cassava meal	5.69
Wheat offal	19.56
Palm Kernel Cake	10.00
Dicalcium phosphate	3.00
Salt	0.50
Premix mixture	0.50
Total	**100:00**
Calculated value:	
Crude protein	14.00
Crude Fiber	13.71
Ether Extract	5.30
DE (kcal/kg DM)	2200

*By-product of local (gin factory) grain processing. DE = Digestible Energy

Slaughtering Procedure

At the end of the trial, three rams from each breed were sacrificed. The animals after a 16-hour fasting period were slaughtered according to the animal welfare rules. Slaughtering was by severing the carotid at the base of the neck towards the spinal cord ensuring the cut of arteries, veins, trachea and oesophagus. The bled weight, hot carcass weight and weight of the other non-carcass components were collected and determined. The carcasses were thereafter spilt along the mid line and the right half carcasses were dissected into primal cuts, (the wholesale). Each of which was effectively trimmed to separate the lean meat, bone and fat. They were weighed and multiplied by two to obtain the relative proportions.

Table 2: Chemical Composition of the Concentrate Feed and Hay

Components (g/100g)	Concentrate	Hay
Dry Matter	88.05	91.40
Crude Protein	11.95	9.15
Ether Extract	4.50	0.90
Crude Fibre	11.75	18.65
Ash	4.80	4.00
Neutral Detergent Fibre	53.50	68.70
Acid Detergent Fibre	35.20	49.01
Acid Detergent Lignin	9.89	15.20
Hemicellulose	18.30	19.69
Cellulose	25.31	53.50
Nitrogen free extract	56.95	58.70
Digestible Energy (kcal/kg DM)	3410.30	3960.10

Chemical compositions analysis

The Chemical compositions of the feed dry matter were evaluated and Nitrogen was determined using Micro Kjeldahl procedure according to AOAC (1990), the NDF, ADF and ADL of the feeds were analysed according to Van Soest *et al.,* (1994).

Statistical analysis

The data were collected, subjected to descriptive statistics and analysis of variance of SAS (2002) package and their means were separated.

RESULTS AND DISCUSSION

The Performance of the rams across the breed (Table 3) indicated that the relative differences ($P<0.05$) in the final body weights with the highest in Balami ram. Balami ram exhibited higher average weight gain with 275.01g which is significantly higher than 180.00g, 166.67g and 223.44g for UDA, WAD and YAK rams respectively. This variation could probably be an indication that certain breeds have genetic potential to grow faster than the others (Anurudu, 2011). The overall performances were within the recommendation of 200g/day for tropical sheep breeds, as reported by Kawas *et al.,* (2007) and as suggested Butterfeld, (1988). The findings from these study were however higher than that reported by Dhanda *et al.,* (1999) who gave lower values of 127g, 148g and 167g per day for offspring of Boer x Angora, Boer with Feral, and that of Saanen X Boer respectively. The Feed Conversion Ratio which is the economic trait was found to be low in all the ram breeds. This indicated that all the breeds efficiently utilized the feeds though Balami ram with (8.87) is most efficient while WAD ram (11.64) is the least.

Evaluation of Carcass Characteristics

Carcass characteristics parameters (Table 4) indicated that the ram breeds had no significant differences ($P>0.05$) in relative percentage proportions of bled weights, HCW, CCW and Dressing Percentages (DP) across treatment groups in spite of varying numerical values. However, findings showed that DP ranged from 43.08 to 45.11%. This result is within the range of 46 -56% reported by Zimerman *et al*., 2008 for Creole kids but is lower than 50.01% (Ayanniyi, 2018) for intensively managed Nigerian indigenous goat breeds. The observed values of slaughter weights ranged from 36.48 to 45.68% which is close to 42.08% for Charollais ram managed in warm climate (Momami *et al,* 1997). These findings were comparable with

the submissions of Anjaneyulu *et al*., (2007); El Hag and El Shargi, (1996); Dhanda *et al*., (2003) and Mahgoud *et al*., (2004) who at one time or the other reported that growth rate, feed intake and the average weight gain were breed inherent. Furthermore, the 126g/day for Washera sheep and 120/day for Farta sheep respectively cited by Alemu *et al*., (2020) and Muhammed *et al*., (2018) were lower than that observed from this study. Moreover further checks from fattened Sudanese Desert Lamb elicited very high average daily weight than what was observed in this study.

Table 3. Growth performance characteristics of the indigenous ram breeds in Nigeria

	BREEDS					
Parameters (Kg)	**UDA**	**YAK**	**WAD**	**BAL**	**SEM**	**P-value**
Initial body weight	23.98	24.01	23.77	24.00	0.0997	0.7822
Final body weight	40.08^{c}	44.11^{b}	38.78^{d}	48.77^{a}	0.0148	0.0075
Average feed intake	2.004^{c}	2.205^{b}	1.939^{c}	2.439^{a}	0.1245	0.0007
Average daily weight gain	0.180^{c}	0.223^{b}	0.166^{d}	0.275^{a}	0.0647	0.0225
Feed conversion ratio	11.13^{a}	9.87^{b}	11.64^{a}	8.89^{c}	0.1707	0.0001

$^{a\text{-}c*}$Means within the same row with different superscripts differ significantly ($p<0.05$).
WAD: West African Dwarf Ram; YAK: Yankassa ram; BAL: Balami ram.

Table 4. Percentage proportions of slaughter characteristics to final body weight of breeds

	BREEDS					
Parameters	**UDA**	**YAK**	**WAD**	**BAL**	**SEM**	**P-value**
Bled weight (%)	94.23	94.09	94.07	94.08	0.0997	0.7822
Empty body weight (%)	59.16^{a}	59.15^{a}	59.20^{a}	55.65^{b}	0.0148	0.0075
Hot carcass weight (%)	45.10	45.09	45.07	45.09	0.1238	0.0009
Cold carcass weight (%)	42.50	43.07	42.57	43.06	1.1201	0.7885
Chilling Loss (%)	2.60^{a}	1.97^{c}	2.15^{b}	2.20^{b}	0.1400	0.0004
Dressing percentage (%)	45.11	43.49	45.08	45.09	1.220	0.8435

$^{a\text{-}c*}$Means within the same row with different superscripts row differ significantly ($p<0.05$).
WAD: West African Dwarf Ram; YAK: Yankassa ram; BAL: Balami ram.

Distribution of tissues in carcass of rams breeds

The percentage lean and fat have positive correlation with weight increase; the percentage bone on the other hand had an inverse relationship. This is because as the animal reaches maturity, the ratio of bone to carcass decreases while that of muscle to bone and Total Fat Deposits (TFD) increases. This phenomenon is in line with reports of Rao *et al*., (2009) and Ayanniyi, (2018). The percentage increase in lean meat results in decrease in bone and this was observed across the different treatment irrespective of the breeds evaluated. The findings were somewhat similar to submission of Aziz *et*

al., (1993), who gave a similar but lower value to results from the present study.

The percentage proportions of lean meat, bone and fat varied (P<0.05) significantly among the treatment groups (Table 5). This could be attributed to inherent trait differences across the breeds. For examples balami rams yielded 73.41% lean meat which was higher than 62.99, 63.7 and 69.70% for UDA, WAD and YAK rams respectively. Furthermore, in spite of low mutton yield exhibited by UDA ram, the proportions of bone were comparatively higher than that of Balami rams that yielded highest mutton. The ratio of lean meat to fat decreases as the weight of the bucks increases (Table 5). Incidentally, most values observed in this work were lower than the values of lean meat (75.57%) to bone (<14.44%) reported by Akinleye *et al*., (2016), this may be due to increase in dietary energy level of 2.8Mcal/Kg DM offered to the animals in their study as against 2.2 Mcal/Kg DM in this work. The relatively close value of meat to bone ratio in this present work indicated a uniformly similar trend where body tissues developed in the animals under investigation. These simultaneous accumulations of muscle and fat and deposition of bones were in line with reports of Attah, (1997), Okubanjo *et al*., (1997) and Ayanniyi *et al.,* (2021) who at one time or the other reportedly affirmed proportional depositions of body tissues to increase in weights of the animals at slaughter.

Table 5. Distribution of rams' carcass tissues across breeds

	BREEDS					
Parameters (%)	**UDA**	**YAK**	**WAD**	**BAL**	**SEM**	**P-value**
Lean	62.99^{c}	69.45^{b}	63.70^{c}	73.41^{a}	0.0997	0.7822
Bone	24.68^{a}	19.92^{b}	23.85^{a}	13.04^{c}	0.0148	0.0075
Fat	10.87^{b}	10.02^{c}	10.91^{b}	12.70^{a}	0.0110	0.0023
Lean : fat	5.79^{b}	6.93^{a}	5.84^{b}	5.78^{b}	0.1238	0.0009
Lean : bone	2.55^{c}	3.49^{b}	2.67^{c}	5.63^{a}	0.0647	0.0225
Loss	1.36^{b}	0.60^{d}	1.52^{a}	0.89^{c}	0.1705	0.0001

$^{a\text{-}c*}$Mean value within the same row with different superscripts differs significantly (p<0.05).
WAD: West African Dwarf Ram; YAK: Yankassa ram; BAL: Balami ram.

CONCLUSIONS

- Balami ram have better feed conversion ratio, faster growth and yielded more mutton than the other three breeds when fattened, even in a relatively warm climate.
- To meet up with the protein requirements by man, fattening Balami ram against other breed is of greater advantage.

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