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Male Reproductive Organ Morphometric Characteristics of White Fulani (Bunaji) Bulls Fed Varying Levels of an Agro-Industrial By-Products (AIBP) Based Diets in Feedlot.

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Abstract: *Morphometric characteristics of White Fulani (Bunaji) bulls fed elephant grass forage supplemented with varying levels of an Agro industrial by-products (AIBP) based diet in feedlot were evaluated in this study .The bulls were two years of age and had an average weight of 117 kg. The animals were randomly assigned to three treatments of two replicates in a completely randomized design and fed the experimental diets at 1.0, 2.0 and 3.0% body weights, corresponding to T_1, T_2 and T_3, respectively. The experimental diets were formulated using maize, palm kernel cake (PKC), brewers dried grain (BDG), bone ash and salt. Morphometric characteristics evaluated were: right and left testicular lengths, epididymal and vas deferens lengths, penis lengths, right and left scrotal circumference, right and left testicular volume, as well as, right and left caput, corpus, cauda and vas deferens weights. At the end of 90 days (duration of the research), the animals were slaughtered, scalded, eviscerated, and evaluated. Data obtained were subjected to One-way Analysis of Variance (ANOVA) using Statistical Package for Social Science (SPSS). The right and left vas deferens length values were 15.10±0.86, 14.75±0.52, 12.55±0.57 and 16.65±0.51, 17.00±0.37, 13.60±0.18cm respectively. Right caput and left caput weights recorded were 5.55±2.23, 2.85±0.13, 4.25±0.35 and 5.40±0.46, 4.15±0.55, 3.85±0.76g respectively for the various treatments. Right and left vas deferens weight values obtained were 1.40±0.00, 0.90±0.00, 0.65±0.13 and 1.47±0.27, 0.14±0.23, 1.61±0.18 while the penis lengths were 53.25±1.48, 55.05±1.18 and 52.00±0.42cm for the various treatments respectively. The result of this study show that the bulls differed significantly ($P<0.05$) in their right caput weight, right vas deferens weight and left vas deferens weights. Other morphometric characteristics studied did not differ ($P>0.05$) among the various diets. It was concluded that supplementation of the Bunaji bulls ration at 3.0% level enhanced their reproductive performance.*

Key Words:*Anova, Bulls, Diets, Morphometric, Peformance, White Fulani.*

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I. Introduction

The general performance of Nigeria's indigenous cattle breeds compared to others has been attributed to many factors including nutrition and management methods. Feeding cattle (bulls) on natural grazing does not provide adequate nutrition to enable fast growing animals to express their genetic potentials for growth (Keith et al., 2013). Nigeria, like most African countries have witnessed an increase in agricultural development so as to meet and sustain the increasing demand for livestock products such as milk, beef and cattle skin Agro-industrial by- products are usually very useful in the provision of micro and macro nutrients which are essential in body growth, enhancing optimum performance of reproductive traits, meat quality and immunity build up to help fight against pathogens. The use of agro industrial by- products or agricultural wastes such as rice bran, maize/corn bran, cassava chaffs or sievate, wheat bran, brewer's dried grain (BDG) and palm kernel meal etc. in ruminant feeding appears to be the available option left for farmers in addressing the problem of competition between human beings and animals for conventional feed ingredients (Babayemi*et al.,* 2006). Nigeria produces large quantities of agro-industrial by-products annually. Converting them to feedlot fattening of Bunaji bulls will help improve performance of the animals. Feedlot concept of beef feeding is the massing of cattle for intensive feeding and its operation therefore is a system whereby cattle are fed in confinement. The improved performance of cattle in feedlot is reasoned to be caused by the animals saving energy which could have been used in grazing and converting it to body weight and the availability of higher quality feeds which provide nutrients as the rumen micro organisms are aided by availability of a convenient environment to work on the scabrous feeds so as to liberate the nutrients encapsulated therein (Moran, 2005). The White Fulani (Bunaji) cattle in Nigeria are known for their good beef production (Hill, 1988) and population; majority of people

depend on them for meat. They constitute about 51% of the total cattle population of 14million in Nigeria (Mbanasor, 2000), and play a role in subsistence agriculture in that it is milked by herdsmen for sale. Bulls play an important role in influencing herd fertility and makes a significant contribution to the genetic improvement in both natural and artificially bred herds. There is therefore, need to focus attention on the production of livestock whose nutritional requirements does not put much pressure on the limited source of feed ingredients to which man also subscribes. This study was therefore conceived to evaluate the morphometric (reproductive) parameters of White Fulani (Bunaji) bulls fed agro-industrial by-product based diets.

II. Materials And Methods

Experimental Diet Formulation and/Preparation

The feed inputs used in feed formulation were sourced from local livestock stores and the feed prepared using the formula in Table 1 while the chemical compositin of the feed inputs is shown in Table 2.

Experimental Animals

Six Bunaji bulls, aged two years and weighing 118kg on the average were purchased from the Makurdi International Market and taken to the experimental site. The bulls were treated for internal and external parasites using Oxytetracycline10%(Tridox LA^{R}), Ivermectine and Inothrine 5% Pour On. The animals were quarantined for a period of 30 days after which they were weighed and allotted to the four treatments. During the experimental period, each of the bulls was housed in a pen measuring 3.6m x 2.5m (length and width) constructed of wood and roofed using corrugated iron sheets. The supplement was served in troughs made from metal drums that had been cut into two along the length and fitted with metal rods to enable them remain in standing position while he drinking water was served in plastic basins.

Data Collection

During the experimental period, the bulls were daily offered the supplemental ration from 8.00am to 10.00am (two hours) after which they were served the forages. The Reproductive samples were collected from the Farm and taken to the Department of Animal Production Laboratory, University of Agriculture, Makurdi for evaluations (measurements). Morphometric measurements taken were: scrotal circumference, testicular volume, as well as caput, corpus, cauda and vas deferens weights. The scrotal circumference was determined using a thread placed at points where the circumference of the scrotum was maximum (Butswat, 1994) and measured with a meter rule. After dissection of the scrotum, adhering connective tissue and fat were carefully removed and the testis excised. The volumes of the right and left testes were determined by water displacement method (Egbunike, 1980). Each epididymis was divided into its components viz, caput, corpus and cauda (Ashdown and Hancock, 1975).

Study Environment

The study was conducted at the Cattle Unit of the Livestock Teaching and Research Farm of the University of Agriculture, Makurdi. Makurdi is located on latitude 7^{0} 14 N^{1} and longitude $8^{0}31^{1}$ and a height of 90 meters above sea level in the Southern Guinea Savannah ecological zone of Nigeria. The rainy season spans from May to October, while dry season spans from November to April, mean annual rainfall ranges from 1270 to 1397 mm. Mean temperature ranges from 22.3^{o}C to 33.41^{0}C; the mean relative humidity is 64.58 (Ahemen et., 2011). The University of Agriculture is located on a land mass of 7,986.22 hectares (F G N, 2011) out of which less than half is occupied by buildings and crop farm, the rest is natural grassland unto which cattle are grazed.

Experimental Design/Procedure

The study was conducted using the Completely Randomized design. The six bulls were allotted into three groups of two each and each animal served as a replicate.

Table 1. Experimental feed formula

Ingredient	Percent Inclusion
Brewer Dried Grain	30
Palm Kernel Cake	30
Maize Offal	36
Bone Ash	3
Table Salt	1
Nutrient Composition	
Dry Matter (%)	90.41

Crude Protein (%)	16.16
Crude Fibre (%)	9.38
Ether Extract (%)	5.32
Nitrogen Free Extract (%)	57.96
Ash (%)	11.12
Gross Energy (Kcal/kg)	2.88

Table 2. Chemical Composition of Feed Inputs Used in Supplementary Feed Formulation

Chemical Component	Input		
	Brewers Dried Grain	Palm Kernel Cake	Maize Offal
Dry Matter (%)	90.26	91.38	90.70
Crude Protein (%)	21.63	18.23	12.19
Ether Extract (%)	3.84	6.58	2.10
Crude Fibre (%)	14.90	13.70	10.87
Ash (%)	6.27	4.78	3.89
Nitrogen Free Extract (%)	53.36	56.71	70.95
Gross Energy (Kcal/ Kg)	3.22	4.49	3.57

Treatments

The three dietary treatments were:

T1: Fed forage of elephant grass *ad libitum* and the supplement at 1.0 % body weight

T2: Fed forage of elephant grass *ad libitum* and the supplement at 2.0 % body weight

T3: Fed forage of elephant grass *ad libitum* and the supplement at 3.0 % body weight

Experimental Design/Procedure

The study was conducted using the Completely Randomized design. The six bulls were allotted into three groups of two each and each animal served as a replicate.

Data Analysis

Collected data were analyzed using Analysis of Variance (ANOVA) package of (Minitab, 1991) and significant differences in means were separated using Duncan's Multiple Range Test as outlined (Steel and Torrie, 1980)

III. Results And Discussion

Table 4 shows values of morphometric parameters for the respective AIBP diets. There were no significant differences ($P>0.05$) in all the values except the right caput, right vas deferens and left vas deferens weights. Values of right caput and right vas deferens weights at the 2% and3% levels of inclusion of the by-products were similar and significantly ($P<0.05$) lower than values recorded at the 1% inclusion level. Values of the left vas deferens weight at the 2% level of inclusion level was significantly ($P<0.05$) higher than values recorded at the 1% and 3% levels of inclusion. Most of the values obtained at the 1% diet (right testicular length, right and left scrotal circumference, right and left testicular volume, right and left epididymal length, right and left caput weight, right and left caudal and right and left vas deferens weights) were generally higher than values recorded at the higher levels of inclusion. Table 5 shows a general comparison of right and left morphometric values of White Fulani (Bunaji) bulls fed the experimental diets at different supplementation levels. Apart from the epididymal length, the left mean values of all the parameters were generally higher than their right counterparts. These left and right reproductive parameters were however, not significantly different ($P>0.05$) from each other. Higher weights observed in the left morphometric organs agree with the study of Ott *et al*. (1982) who reported that the left testis was 10% larger than the right testis in rams. Similar reports have been recorded by Macmillan and Hats (1969) in buffaloes, cattle and goats. Ahmad *et al*. (1985) reported that heavier testes produce more spermatozoa than smaller ones. Berndson *et al*. (1987) asserted that a testis, which possessed greater number of sustentocytes is heavier and produce more spermatozoa than testes with fewer sustentocytes.The average testes weights recorded in this study are lower than average values of 259.00 ± 24.3g and 116.5 ± 4.7g recorded for Holstein (Almquist and Amann, 1961) and Bunaji (Osinowo*et al.*, 1981) breeds of cattle respectively. Scrotal circumference value of 13.2 ± 0.94cm reported by Osinowo *et al*. (1981) for Bunaji bulls is slightly higher than values obtained in this study. Variations of values we obtained from the above authors could be due to breed and diets used in the studies The mean testicular volume obtained in this study is higher than that reported by Besta (2006) in rams. Most of the parameters observed in this study are

higher than values reported in rams by Soderquist and Hulten (2006). Higher values in this work relative to those recorded in rams is anticipated because of the specie differences.

IV. Conclusion And Recommendations

In this study, the possibility of feeding Bunajibulls elephant grass *ad libitum* and varying quantities of an agro-industrial by-products based diet was well demonstrated. Left reproductive values were generally higher than their right counterparts at the highest inclusion level demonstrating the potential agro- industrial by-products in enhancing production in bulls. The result of this study will serve as useful information to Nigerian cattle fatteners.

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Table 4: INFLUENCE OF AGRO-INDUSTRIAL BY-PRODUCTS BASED DIETS SUPPLEMENTATIONON MORPHOMETRIC CHARACTERISTICS OF FEEDLOT WHITE FULANI (BUNAJI) BULLS (MEAN ± SEM)

Parameters	**Treatments**			
	T1	**T2**	**T3**	**LOS**
Right Test. Length (cm)	8.55±0.13	8.25±0.51	7.55±0.13	NS
Left Test. Length (cm)	8.45±0.13	9.00±0.059	7.30±0.26	NS
Right Scrotal Circumference (cm)	11.45±0.13	9.95±0.39	9.80±0.67	NS
Left Scrotal Circumference (cm)	11.90±0.19	11.35±0.58	11.20±0.62	NS
Right Testicular Volume (g/cm^3)	70.00±0.00	50.00±1.88	30.00±0.00	NS
Left Testicular Volume (cm)	75.00±1.32	60.00±2.65	50.00±1.88	NS
Right Epididymal Length (cm)	13.10±0.70	10.80±0.67	10.65±0.13	NS
Left Epididymal Length (cm)	11.95±0.44	9.50±1.05	11.75±0.51	NS
Right Vas Deferens Length (cm)	15.10±0.86	14.75±0.52	12.55±0.57	NS
Left Vas Deferens Length (cm)	16.65±0.0.51	17.00±0.37	13.60±0.18	NS
Right Caput Weight (g)	5.55±2.23^a	2.85±0.13^b	4.25±0.35^b	*
Left Caput Weight (g)	5.40±0.46	4.15±0.55	3.85±0.76	NS

Right Corpus Weight (g)	1.85±0.44	1.05±0.23	0.95±0.13	NS
Left Corpus Weight (g)	1.75±0.13	1.15±0.25	0.95±0.23	NS
Right Cauda Weight (g)	4.25±0.57	2.35±0.13	1.90±0.26	NS
Left Cauda Weight (g)	4.10±0.62	2.75±0.35	2.20±0.56	NS
Right Vas Deferens Weight (g)	1.40±0.00^{a}	0.90±0.00^{b}	0.65±0.13^{b}	*
Left Vas Deferens Weight (g)	1.47±0.27^{a}	0.14±0.23^{b}	1.61±0.18^{a}	*
Penis Length (cm)	53.25±1.48	55.05±1.18	52.00±0.42	NS

SEM = Standard error of the mean; LOS = Level of significance, NS = Not significantly different (P>0.05); *: a, b means on same row with different superscripts differ significantly (P<0.05).

Table 5: MORPHOMETRIC PARAMETERS OF RIGHT AND LEFT ORGANS OF WHITE FULANI (BUNAJI) BULLS FED AIBP BASED DIETS IN FEEDLOT. (MEAN ± SEM)

Parameter (Gonad)	**Right Gonad**	**Left Gonad**	**LOS**
Testes Weight (g)	57.23±7.19	69.10±6.47	NS
Epididymil Weight (g)	7.87±1.33	8.83±1.17	NS
Caput Weight (g)	4.22±0.50	4.47±0.59	NS
Corpus Weight (g)	1.28±0.23	1.28±0.16	NS
Candal Weight (g)	2.83±0.52	3.02±0.52	NS
Vas Deferens Weight (g)	0.98±0.14	1.15±0.23	NS
Tunic Weight (g)	6.45±0.79	6.87±0.80	NS
Testicular Length (cm)	8.12±0.27	8.25±0.41	NS
Scrotal Circumference (cm)	10.40±0.49	11.48±0.04	NS
Epididymal Length (cm)	11.52±0.70	10.98±0.98	NS
Vas Deferens Length (cm)	14.13±0.80	15.75±0.72	NS
Testicular Volume (g/cm^{3})	50.00±8.16	61.67±7.49	NS

SEM = Standard error of the mean,
LOS = Level of significance
NS = Not significantly different (P>0.05)

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