

PERFORMANCE, NUTRIENTS INTAKE AND DIGESTIBILITY OF UDA RAMS FED GRADED LEVELS OF (*BAUHINIA MONANDRA*) SEED MEAL IN DIETS

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ABSTRACT

This study was conducted to determine the response of growing Uda rams fed graded levels of *Bauhinia monandra* seed meal (BMSM) in diets. Diets containing 16% crude protein (CP) were formulated for the experiment, having 0, 5, 10, 15 and 20% graded levels of BMSM with cotton seed cake (CSC), incorporated in the diets. Fifteen growing uda rams averaging ± 10.9 kg were randomly assigned to completely randomized design (CRD), three replications. The animals were fed the experimental diets and clean water daily ad-libitum. The results showed significant ($p < 0.05$) difference in average daily feed intake (ADFI). Diet 3 i.e. 10% inclusion level had the highest mean value of 1.21kg, followed by diets 1, 4 and 5 both with same values 1.19kg, while diet 2 had the lowest mean of 1.18kg. Weight gain and average daily weight gain were significantly ($p < 0.05$) affected. Higher mean values were recorded for higher levels of inclusion from 0% -20% (3.90 to 5.62) kg and (55.71 to 81.00) g/day respectively. Feed conversion ratio were significantly ($p < 0.001$) affected. Animals fed diets 4 and 5, had better feed conversion ratio of 15.81 and 14.71 than diet 1, 2 and 3 (21.41, 20.80 and 17.08). Dry matter intake as percentage body weight (DMI % BW) was significant ($p < 0.05$). Diets 4 and 5 had higher mean values of 1119.99g/d and 1111.46g/d than 2 and 3 with 1092.68g/d and 1089.00g/d respectively. However, there is no significant difference in all the nutrients intake parameters except for DMI as % BW. Dry matter digestibility (DMD) was significantly ($p < 0.05$) affected. Higher mean values were observed across the treatments, with diet 4 as superior (66.13%), diets 3 and 4 same (60.31% and 61.46%) and diets 1 and 2 with lowest mean values (55.95% and 52.99%). Organic matter (OM) and crude protein (CP) digestibility followed same trend with DMD. With 73.55% and 69.50% as the highest values respectively. Neutral detergent fiber digestibility (NDFD) were significantly ($p < 0.05$) affected, 0% and 15% were the same with higher values (66.00%, 64.50%). Acid detergent fiber digestibility (ADFD) was found to progressively increase as the inclusion levels increased from 0%-20% (57.50% to 66.00%). Inclusion of BMSM at graded levels of up to 20% in the diets of growing uda rams has no detrimental effect on growth performance, nutrients intake and digestibility. Diet 5 is therefore recommended for growing uda rams.

Key words: Performance, Nutrient intake, Uda rams, *Bauhinia monandra* seed, Cotton seed cake

INTRODUCTION

In Nigeria, *B. monandra* is fairly widely distributed throughout the natural grassland of Northern Nigeria, stretching throughout the Savanna. It is a spreading tree with large leaves, pink and white flowers with one large anther which is elongated and sharply pointed, very persistent pods which split open by explosive mechanism (Keay *et al.*, 1989). Pods are flattened, leathery and green when fresh but brownish or black when dry. Seeds are ovate, compressed and dull brown.

The major constraints to the use of legumes as animal feed especially in its raw form, is the presence of toxic and anti-nutritional constituents. These constituents when present in high quantities have detrimental effects on the animal's performance which include loss of appetite, reduction in dry matter intake and effect on protein digestibility (Anwa *et al.*, 2007). Lack of comprehensive compositional data regarding essential nutrients and anti-nutrient compositions of the seed of several wild indigenous plants have limited the prospects of their utilization as livestock feed in Nigeria. Anhwange *et al.*, (2004, 2005) reported that the percentage composition of proteins, lipids, carbohydrates and fibre in *B. monandra* were 33.09, 28.70, 21.45 and 3.25 respectively. The seed also contain 11.5mg/100g phytate, 0.32mg/100g hydrogen cyanide, 6.0% tannins and 2.05% saponins which are anti-nutrients Anhwange *et al.*, (2005).

The cost of feed ingredients used in livestock feeding is on the upward trend year after year, and this is due to the ever-increasing demand and reduced supply of such feed ingredients, which increased demand and reduced supply of feed ingredients is due to the increase in competition from other species, especially humans (Kumar 2015). The efficiency of use of the available feed resources is especially important as it is the primary determinant of animal performance and productivity (Devendra and Leng, 2011). Fodder resources (cereals, legumes and fibrous crop residues) in warm climates provide the principal sources of feeds for ruminants (Devendra, 1996).

At this period, the performance of ruminant animals which is dependent on the native pasture is seriously impaired; the quality is associated with the fibrous and lignified nature of the pasture which limits intake, digestibility and utilization (Olafadehan *et al.*, 2009).

The problem of dry season feed and feeding has been recognised as a limiting factor to a successful ruminant production enterprise in Nigeria due to poor nourishment of the animals during the dry season which eventually results to a drop in animal performance in terms of growth, work, maintenance, production and reproduction (Darrag, 1995). Therefore, this study was aimed at determining the growth performance, nutrients intake and digestibility of growing udu rams fed graded levels of *B. monandra* seed meal in diets.

MATERIALS AND METHODS

The Study Area

This study was conducted at Teaching and Research Farm Abubakar Tafawa Balewa University Bauchi. The state is located at the Northern Guinea Sudan Savannah zone of northern Nigeria, it is situated between latitudes 9°N and 13°N and longitude 8, 50 and 11 of Greenwich Meridian. The rainfall ranges from 700mm in northern part – 1300mm in the south-western part of the state (BSADP, 2003). The state has a total land area of about 66,000 square kilometers and altitude of 690.3 above sea level. It shares boundaries with Gombe to the East, Kano to the West, Jigawa and Yobe to the North, Plateau and Taraba to the South.

Experimental animal and their management

Fifteen (15) yearling Udu ram lambs with an average live weight of ± 10.9 kg were used for the study which were purchased from Kasuwan Mararaban Liman Katagum at Bauchi. The animals were quarantined for 14 days during which they were, vaccinated against *pestes despetit ruminant*, dewormed with Albendazole® 10% suspension for internal parasites and injected intramuscularly with antibiotic, i.e., Oxytetracycline L.A (Alfasan ®) 20%, at 1ml per 10kg body weight. The animals were randomly assigned to five dietary treatments with three (3) animals per treatment designed in a completely randomized design (CRD), each animal were housed in a separate pen. The feeding trial was conducted for 84 days (14 days adjustment period to the experimental feeds and 70 days for data collection).

Treatments and experimental design

Five diets containing 16% CP were formulated from cotton seed cake, BMSM, maize bran, molasses, salt, and bone meal at 0, 5, 10, 15, and 20%, replacement of *B. monandra* for cotton seed cake.

Ingredients and chemical compositions of the experimental diets was shown in Table 1 and Table 2 respectively.

Table 1: Ingredient composition (%) of the experimental diets

Ingredients, kg	Diets				
	1	2	3	4	5
Maize offal	71.86	70.91	69.99	69.02	68.13

Cotton seed cake	20.64	16.70	12.50	8.48	4.37
Bauhinia seed meal	0.00	5.00	10.00	15.00	20.00
Molasses	5.00	5.00	5.00	5.00	5.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Common salt	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100

Nutrient composition (Calculated)

Crude protein (%)	16.00	16.00	16.00	16.00	16.00
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Diet 1 = 0% BMSM with cottonseed cake (CSC) at 20%, Diet 2 = 5% BMSM, Diet 3= 10% BMSM, Diet 4 = 15% BMSM, Diet 5 = 20% BMSM

Table 2: Chemical composition (%) of the experiment diets

Parameters	Diets				
	1	2	3	4	5
DM	93.19	92.60	90.00	94.10	93.40
OM	88.00	82.34	85.10	87.23	86.43
CP	12.90	12.46	11.99	13.30	13.56
ADF	34.13	32.34	29.55	29.10	29.00
NDF	45.90	43.48	42.81	40.90	41.89
Hemicellulose	11.77	11.14	13.26	11.80	12.89

DM = dry matter, OM = organic matter, CP = crude protein, ADF = acid detergent fiber, NDF =neutral detergent fiber, Diet 1 = 0% BMSM with CSC at 20%, Diet 2 = 5% BMSM, Diet 3= 10% BMSM, Diet 4 = 15% BMSM, Diet 5 = 20% BMSM

The corresponding diets were available every day at 7 a.m. Animals were given weighed portions of their respective complete meals at any time during the feeding trial. To determine the animals' daily feed consumption, residues, if any, were weighed the next morning before the feeding of the animals. The animals were given access to clean, fresh drinking water, and a daily water consumption log was kept. The animals' initial body weights, weekly weights, and final body weights were all measured to determine the animals' growth performance. The 84-day testing period included a 14-day adaption period.

Data collection

Feed offered and refusals were recorded daily throughout the experimental period. Feed intake was calculated as the difference between feed offered and refusal from each animal per day. Weight gain was

calculated as the difference initial body weight and total weight gain of the rams at the end of the experimental period. Feed conversion ratio and dry matter intake were also determined.

Chemical analysis

Before commencing the study, experimental feed samples were analyzed for their chemical composition. The DM content was determined by overnight drying at 105°C according to the methods of the Association of Official Analytical Chemists (AOAC 1990). The ash content was determined by igniting the sample in a muffle furnace at 550°C for 3 hours (AOAC, 1990). Total nitrogen (N) content was determined using the Micro Kjeldahl method, and the crude protein (CP) was calculated as $N \times 6.25$. The acid detergent fiber (ADF) and neutral detergent fiber (NDF) were determined according to Van Soest and Robertson (1985).

Faecal collection and digestibility Study

At the end of the growth trial, all rams from each treatment group were housed in metabolic crates for total faecal collection for the determination of nutrient digestibility. The animals were allowed 7 days adjustment period in the metabolic crates and the same feed and feeding procedure used during the growth trial was applied during the digestibility study. Afterwards, the collection period lasted for another 7 days. The animals were fed the experimental diets as they were fed during the feeding trial based on their individual treatment. Daily faecal output was weighed and 10% of each day's collection was sub sampled and oven dried for DM determination and subsequent laboratory analysis.

Experimental design and statistical analysis

The experimental design was a completely randomized design (Steel and Torrie, 1980), with five treatments of four animals each. Data collected were subjected to Analysis of variance (ANOVA) as described by Steel and Torrie (1980) using MINITAB 16 (2014). Where significant differences existed between means, Duncan's new multiple range test (DMRT) was used to separate them.

RESULTS AND DISCUSSION

There was significant ($p < 0.05$) difference in average daily feed intake (ADFI) as presented in Table 3. Animals fed diet 3 recorded the highest ADFI of 1.21kg, followed those fed diets 1, 4 and 5 with ADFI of 1.19kg, while diet 2 came last with 1.18kg.

Table 3: Performance of uda rams fed replacement value of (*B. monandra*) for cotton seed cake in diets

Parameters	Diets					SEM	LOS
	1	2	3	4	5		
TFI (kg)	83.50	83.00	84.90	83.33	83.43	2.53	NS
ADFI (kg)	1.19 ^b	1.18 ^c	1.21 ^a	1.19 ^b	1.19 ^b	0.001	*
Initial BW(kg)	8.67	8.47	9.70	10.37	9.10	7.35	NS
FBW (kg)	12.57	12.46	14.87	15.63	14.75	5.24	NS
Weight gain (kg)	3.90 ^e	3.99 ^d	4.97 ^c	5.27 ^b	5.67 ^a	0.30	**
ADWG(g/day)	57.00 ^c	57.00 ^c	71.00 ^b	75.30 ^b	81.00 ^a	127.10	**
FCR	21.41 ^a	20.80 ^a	17.08 ^b	15.81 ^c	14.71 ^c	3.96	***
DMI % BW	1108.96 ^c	1092.68 ^b	1089.00 ^b	1119.99 ^a	1111.46 ^a	7.96	*

, ^{abc} Means in the same row without common letter are different, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, TFI=total feed intake, ADFI= average daily feed intake, FBW=final body weight, ADWG=average daily weight gain, FC feed conversion ratio, Diet 1 = 0% *B. monandra* seed meal (BMSM) with cottonseed cake (CSC) at 20%, Diet 2 = 5% BMSM, Diet 3= 10% BMSM, Diet 4 = 15% BMSM, Diet 5 = 20% BMSM

There is a significant difference ($p < 0.01$) in total weight gain (TWG) across the diets. The results reveals that higher mean value of 5.67kg was recorded in animals fed diet 5, followed by 5.27kg for animals fed diet 4, and animals fed diet 1 recorded the lowest mean for TWG (3.0kg). Average daily weight gain (ADWG) was significantly ($p < 0.01$) affected across the treatment means. Animals fed diet 5 recorded highest mean of 81.00g/d, followed by animals fed diets 3 and 4 with similar ADWG of (71.08 and 75.30) g/d respectively. Animals fed diet 1 and 2 had the lowest mean of 5.7g/d.

Significant ($p < 0.001$) difference was observed in animals feed conversion ratio across the diets. Animals fed die 5 and 4 had better FCRs of 14.71 and 15.81, followed by diet 3 with 17.08 mean value respectively. However, animals fed diets 1 and 2 recorded low FCR (21.41g/d). The dry matter intake % body weight (DMI as %BW) was significantly affected ($p < 0.05$) across the diets. Rams fed diets 4 and 5 had DMI as %BW of 1119.99% and 1111.64% compared to those animals fed diets 2 and 3 with 1092.68 and 1089.00.

Nutrients Intake of Uda Rams fed Graded levels of *B. monandra* seed meal in diets

The nutrients intake of the animals recorded no significant difference for all the parameters from organic matter intake (OMI), crude protein intake (CPI), neutral detergent fiber intake (NDFI) and acid detergent fiber intake (ADFI).

Table 4: Nutrients Intake of uda Rams fed Graded levels of (*B. monandra*) seed meal in diets

Parameters	Diets					SEM	LOS
	1	2	3	4	5		
OMI	975.88	899.71	926.74	976.97	960.63		NS
CPI	143.06	139.15	130.57	148.96	150.71		NS
NDF I	378.49	353.37	321.80	325.92	322.32		NS
ADF I	509.01	475.10	466.20	458.08	465.59		NS

OMI = organic matter intake, CPI = crude protein intake, NDFI= neutral detergent fiber intake, ADFI=acid detergent fiber intake, ^{abc} Means in the same row without common letter are different, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, TFI=total feed intake, ADFI= average daily feed intake, FBW=final body weight, ADWG=average daily weight gain, FC feed conversion ratio, Diet 1 = 0% *B. monandra* seed meal (BMSM) with cottonseed cake (CSC) at 20%, Diet 2 = 5% BMSM with CSC at 15%, Diet 3= 10% BMSM with CSC at 10%, Diet 4 = 15% BMSM with CSC at 5%, Diet 5 = 20% BMSM with CSC at 0%

Nutrient digestibility of uda rams fed experimental diets

Nutrient digestibility of the animals, showed that dry matter digestibility (DMD) increased with increasing levels of *B. monandra* across the diets (55.95-66.13). Organic matter digestibility (OMD) and crude protein digestibility (CPD) which were significantly affected ($p < 0.05$) also showed the same trend for DMD, (57.11 - 73.55) and (54.00 - 69.50) respectively.

Table 5: Nutrient digestibility of Uda Rams fed Graded levels of *B. monandra* seed meal in diets

Parameters	Diets					SEM	LOS
	1	2	3	4	5		
Dry Matter	55.95 ^c	52.99 ^c	60.31 ^b	61.46 ^b	66.13 ^a	1.48	*
Organic Matter	57.11 ^c	59.68 ^c	66.75 ^b	67.81 ^b	73.55 ^a	2.15	*
Crude Protein	54.00 ^c	53.68 ^c	64.00 ^b	65.50 ^b	69.50 ^a	1.07	*
NDF	66.00 ^a	63.00 ^{ab}	60.50 ^b	64.50 ^a	64.00 ^{ab}	1.48	*
ADF	57.50 ^{bc}	54.00 ^b	62.00 ^{ab}	66.00 ^{abc}	66.00 ^a	2.48	*
Hemicellulose	8.50	9.00	1.50	1.50	2.00	1.00	

NDF= neutral detergent fiber, ADF= acid detergent fiber

CONCLUSION AND RECOMMENDATION

From the study carried out it can be concluded that *B. monandra* seed meal, up to 20% can replace Cotton seed cake in the diets of growing Uda rams without causing any detrimental effects on growth performance, nutrients intake and digestibility. Up to 20% of *B. monandra* seed meal is recommended for growing Uda rams due to high growth rate (81.00g), better FCR (14.71) and good crude protein digestibility (69.50%).

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