

Response of Growing Yankasa Sheep Fed Graded Levels of Acacia (*Faidherbia albida*) Pods Based Diets.

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Abstract

The study was conducted to investigate the response of Yankasa rams fed graded levels of *Faidherbia albida* pods-based diets on nutrient intake and growth performance parameters. Complete diets containing 16% CP were formulated for the trial using *F. albida* at different levels as follows: 0 (control), 7.50, 15.00, 22.50, and 30.00% and designated as treatments 1, 2, 3, 4 and 5 respectively. Twenty Yankasa rams were used for the experiment with average initial body weight of 16.72kg and were randomly allocated to five treatment groups of five animals each in a completely randomized designed (CRD). Rams were fed experimental diets and water *ad libitum*. The experiment lasted for 90 days. The results of the study revealed significant ($P < 0.05$) nutrient intakes, average daily weight gain (ADG) and feed conversion ratio (FCR). Animals fed diet 5 recorded highest daily feed intake (1026.26g/d), dry matter (916.56g/d) and crude protein (169.12 g/d), while those fed diet 1 had the lowest (684.39g/d, 613.56g/d and 108.57g/d), respectively. Treatment 5 had the highest ADG (147.9 g/d) and treatment 1 with the least (58.68 g/d). Better feed conversion ratio (6.20) was also recorded in treatment 5 with the worst in control (10.46). It may therefore be concluded that up to 30% *F. albida* pods may be included in the diets of growing Yankasa rams due to increased DMI (916.56 g/d), a higher weight gain (147.9 g/d) and better FCR (6.20). Therefore, this diet is recommended for growing Yankasa sheep.

Keywords: Sheep farmer, Animal scientist, Nutritionist, Extension workers

Description of Problem

According to (1,2) one of the major factors limiting the productivity of small ruminants in developing countries is over dependence on low digestibility feeds which during the dry season cannot meet even the maintenance requirements of these animals. These feeds resources were categorized as high fibre and

low protein feeds having organic matter digestibility between 30-45% and they include native grasses, crop residues and fibrous agro-industrial waste products. They form the bulk of feeds consumed by small ruminants in tropical countries because they are producing in large quantities and are relatively cheap since they are not competed

for by man or monogastric animals (3).

In recent years there has been a growing interest in many tropical countries to identify potentially important feeds sources among shrubs and trees for inclusion in the ruminant diet to provide browse (shoots, fruits and pods) that is high in protein to supplement the available low protein forage. This has been recognized as one of the most effective means of improving animal performance in small holder livestock production (4). Supplementation of tropical roughages with leguminous fodder trees and shrubs otherwise known as Multipurpose trees (MPTS) is a way of alleviating nitrogen deficiencies. These multipurpose trees are high in crude protein contents (12-30%) compared with mature tropical grass (3-7%) (5). Among the well-known multipurpose trees, *Acacia albida* (*Faidherbia albida*) is a potential multipurpose tree capable of producing leaves and pods of high nutritive value. *Faidherbia albida* pods are a major protein supplement used by pastoralist and agro pastoralist in the semi-arid areas. Drought tolerant *Faidherbia albida* pods (*Gawo* in Hausa) is in abundance in the sub-Saharan region of Nigeria, where, the dry pods are important feed resources for both domesticated and wild animals (6,7,8). *Faidherbia albida* pods, one of the common browse tree species available in the semi-arid region could be fed to sheep. This study was therefore designed to investigate the response of growing Yankasa rams fed graded levels of *Faidherbia albida* pods on nutrient intake and growth performance.

Materials and methods

Description of the study area

The experiment was conducted at the Small Ruminant Research Unit of the Department

of Animal Production, Abubakar Tafawa Balewa University Bauchi, Nigeria. Bauchi is situated on latitude 10° 17'



Figure 1: *Faidherbia albida* pods containing seeds

Experimental animals and their management

Twenty-five Yankasa rams were used for this study. The rams were purchased from open market markets within Bauchi State. The animals were quarantined for two weeks during which they were identified using numbered plastic ear tags for easy identification and treated against ectoparasites and endoparasite using Ivermectin (Ivomec®) was given at 0.5ml/25Kg body weight subcutaneously they were also dewormed using albendazole. They were injected intra-muscularly with oxytetracycline long acting (LA) broad spectrum antibiotic according to manufacturer's specifications. The rams were later vaccinated against *Peste des petits Ruminants* (PPR) using a tissue culture rinderpest vaccine. Following the quarantine period, the initial body weights of all animals were measured and they weighed between 15.98 and 17.60 kg (averaged 16.72kg) and were randomly allocated to five treatment groups of five animals each in a Completely Randomized Designed (CRD). The rams

were housed in a cross-ventilated individual pens with slatted floors and were offered known quantities of the experimental diets for 14 days' preliminary period to enable them adapt to diets. Fresh water was made available *ad libitum*. The animals were penned individually and the diets were offered at known quantities, at each time (morning 7:30 to 8:30am and 2:30 to 3:30pm evening). This was done deliberately to determine maximum intake of the

experimental diets. The left over for each animal was measured the following morning before another day's feed was given to ascertain feed intake per day. The feeding trial lasted for 90 days excluding 14 days adaptation period. The animals were weighed at the beginning of the experiment and weekly thereafter throughout the experimental period using a hanging scale (Salter suspended weight model 235).

Table 1: Ingredients and chemical Composition of experimental diets (%)

Ingredients	Treatments				
	T1	T2	T3	T4	T5
Maize offal	52.91	48.12	43.36	38.53	33.72
Cotton seed cake	19.59	16.88	14.14	11.47	8.78
<i>Faidherbia albida</i>	0.00	7.50	15.00	22.50	30.00
Cowpea shell	25.00	25.00	25.00	25.00	25.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00
Nutrients:					
Dry matter	89.65	90.31	89.72	90.25	89.31
Organic matter	80.47	81.06	80.23	80.42	78.96
Crude protein	15.86	16.12	16.45	16.43	16.48
Ash	9.18	9.25	9.49	9.83	10.35
Neutral Detergent Fibre	49.75	49.55	49.43	48.48	48.24
Acid Detergent Fibre	40.88	40.63	40.51	39.83	39.76
Hemicellulose	8.87	8.92	8.92	8.65	8.48

T1-0% *F. albida* , T2-7.5% *F. albida* , T3-15% *F. albida* , T4-22.5% *F. albida* , T5-30% *F. albida*

Chemical analysis

All diets samples were analyzed for Chemical Composition using the (11) methods. Neutral detergents fibre (NDF) and acid detergents fibre (ADF) were determined according to (12) method. Hemicellulose contents was calculated as the difference between NDF and ADF.

Statistical Analysis

Data were analyzed using Statistical Package

for Social Sciences (13) where there is significant difference in analysis of variance (ANOVA) means were separated using Duncan's Multiple Range Test (DMRT).

Results and Discussions

Dry matter and nutrient intake

The daily dry matter and nutrient intake of Yankasa rams fed the experimental diets containing graded levels of *F. albida* are presented in Table 2.

Table 2: Dry matter and nutrient intake of Yankasa rams fed diets containing *F. albida* pods

Parameters	Treatments					SEM
	T1	T2	T3	T4	T5	
Total feed intake (g/day)	684.39 ^d	837.56 ^{bc}	777.36 ^{cd}	976.05 ^{ab}	1026.26 ^a	32.16*
DMI (g/day)	613.56 ^d	756.40 ^{bc}	697.45 ^{cd}	880.88 ^{ab}	916.56 ^a	28.83*
OMI (g/day)	550.73 ^d	678.92 ^{bc}	623.68 ^{cd}	784.94 ^{ab}	810.34 ^a	25.23*
CPI (g/day)	108.57 ^c	135.0 ^b	127.87 ^{bc}	160.39 ^a	169.12 ^a	6.13*
NDFI (g/day)	340.48 ^d	415.01 ^{bc}	384.24 ^{cd}	473.19 ^{ab}	495.07 ^a	15.02*
ADFI(g/day)	279.77 ^d	340.30 ^{bc}	314.91 ^{cd}	388.76 ^{ab}	408.04 ^a	12.41*

^{a-d} Means within each row with different superscripts are significantly different * (P<0.05), T1-0% *F. albida* , T2-7.5% *F. albida* , T3-15% *F. albida* , T4-22.5% *F. albida* , T5-30% *F. albida*, DMI- Dry matter intake, OMI -Organic matter intake, CPI - Crude protein intake, NDFI-Neutral detergent fiber intake, ADFI -Acid detergent fiber intake, SEM - standard error mean

Total feed intake (**TFI**) was significantly (P<0.05) different across the treatments. The TFI increased with the increased levels of *F. albida* pods in the diets. Animals fed diets with 0% of *F. albida* pods recorded the least (684.39 g/day) while those on 30% had the highest (1026.26 g/day). The result of total feed intake clearly demonstrated that increasing levels of *F. albida* in the diets increased total feed intake. This is similar to reports by (2) who indicated that an increase in the levels of *F. albida* in diets from 0 to 30% increased the daily feed intake of lambs from 303.58 to 428.90 g/day. The results of the Dry matter intake (DMI) followed similar pattern as TFI and differed significantly (P<0.05) among the treatments. Animals fed diet 1 recorded the least (613.56 g/day) and diet 5 the highest (916.56 g/day). Animals fed diets 2, 3, and 4 recorded 756.40, 697.45 and 880.88 g/day, respectively. The low intake (T1) might be due to low readily fermentable carbohydrate available to the rumen microbes to utilize in the control diet. This agrees with the reported

by (14) that feed supplemented with *acacia* pods generally had improved dry matter intake (DMI) than those un-supplemented with pods.

Organic matter intake (OMI) was significantly (P<0.05) higher in animals fed diet 5 (810.34 g/day) while those fed diet 1 recorded the least (550.73g/day). The highest value of 810.34g/day recorded for treatment 5 is consistent with the result of the study reported by (15) who stated that the level of supplementation with *F. albida* from 0 to 200g/day increased the organic matter intake from 104.61 to 178.26 g/day. The crude protein intake (CPI) was influenced by the increasing levels of *F. albida* across the diets. Significant (P<0.05) difference was observed between the treatments across the diets. A higher CPI value (169.12 g/day) was recorded for animals fed diet 5 and those fed diet 1 had the lowest (108.57g/day). The high CP intake of 169.12g/day in animals fed diet 5 and the lowest value of 108.57g/day in diet 1 is in conformity with that reported by (16) who fed blackhead Ogaden sheep with diets

containing *F. albida* concentrate. The authors reported CPI of 109g/day in diet containing 30:70 roughages to concentrate and 89.2g/day in diet with 60:40 roughage to concentrate. The neutral detergent fibre intake (NDFI) was significantly ($P>0.05$) higher for animals fed diet 5(495.07g/day) and the least (340.48g/day) for diet 1. This was similar to that reported by (17) for growing rams fed high amounts of *F. albida* in diets. A higher significant ($P< 0.05$) acid detergent fibre intake (ADFI) (408.04 g/day) was recorded for animals fed diet 5, while those fed diet 1 the least (279.77 g/day). The values of 340.30, 314.91 and 388.76 g/day were recorded for animals on treatments 2, 3, and 4 respectively.

Growth performance of Yankasa rams fed diets containing graded levels of F. albida pods

The weight changes and feed conversion ratio (FCR) of Yankasa rams fed diets containing graded levels of *F. albida* pods were presented in Table 3. Total weight was significantly ($P>0.05$) influenced by treatment diets. Animal fed diet 5 had the highest final body weight of 13.46kg, while

those fed diet 1 had the least gains of 5.34kg. Animals fed diets 2, 3, and 4 had 10.16, 9.94 and 10.70kg respectively. Higher increase in body weights of animals fed *F. albida* across the treatments is an indication that diets with *F. albida* were more efficiently utilized than the control diet. Therefore, diet with 30% of *F. albida* pods has provided a better rumen environment for microbial protein synthesis (18). Significant ($P<0.05$) difference was observed in the average daily weight gains (ADG) of the animals among the treatments. Animals fed diet 5 recorded the highest ADG of 147.90g/day, while those on diet 1 the least (58.68g/day). Animals on diets 2, 3, and 4 recorded 109.23, 111.65 and 117.58 g/day respectively. This agrees with the findings of (15) who reported that live weight change varied from 15.0 g/day in sheep on zero level *F. albida* pods to 55.0g/day in sheep on 150g *F. Albida* pods supplement. In the same vein, studies by (19, 20 and 3) revealed that pods of some *Acacia* species, such as *A. tortilis* and *A. albida*, as well as leaves of *A. brevispica*, when given as supplements to poor quality roughages, gave live-weight gains in animals compared to those fed oil seed cakes.

Table 3: Growth performance of Yankasa rams fed diets containing *Fadhebia albida* pods

Parameters	Treatments					SEM
	T1	T2	T3	T4	T5	
Initial body weight (Kg)	16.86	16.90	16.26	17.60	15.98	0.29 ^{NS}
Final body weight (Kg)	22.20 ^b	27.06 ^a	26.20 ^a	28.30 ^a	29.44 ^a	0.74*
Total weight change (kg)	5.34 ^c	10.16 ^b	9.94 ^b	10.70 ^b	13.46 ^a	0.64*
ADG (g)	58.68 ^c	111.65 ^b	110.23 ^b	118.84 ^b	147.90 ^a	6.99*
DMI (g/day)	613.56 ^d	756.40 ^{bc}	697.45 ^{cd}	880.88 ^{ab}	916.56 ^a	28.83*
Feed conversion ratio	10.46 ^e	6.77 ^c	6.39 ^b	7.49 ^d	6.20 ^a	0.32*

a-d Means within each row with different superscripts are significantly different * ($P<0.05$), T1-0% *F. albida*, T2-7.5% *F. albida*, T3-15% *F. albida*, T4-22.5% *F. albida*, T5-30% *F. albida*, DMI-Dry matter intake, ADG - Average daily weight gain, SEM - standard error mean

The values of feed conversion ratio (FCR) significantly ($P < 0.05$) increased progressively as the levels of *F. albida* increased across the diets. Better FCR was observed for animals fed diet 5 (6.20) while those on diet 1 the least (10.46). Rams on treatments 2, 3, and 4 had 6.77, 6.39 and 7.49 respectively. Diet was much more utilized in animals fed diet 5 (6.20) as compared to those on diet 1 (10.46). This is similar to the report of (24) who recorded higher DMI, weight gains and better FCR in diets containing highest inclusion level of *F. albida*.

Conclusion and Application

1. It is concluded from the results of the current study that; *F. albida* pods can be incorporated up to 30% in a mixture with other ingredients in the diets of growing Yankasa sheep without any deleterious effect on their performance.
2. However, inclusion level of 30% *F. albida* pods which gave the highest dry matter intake (916.56g/day) and daily weight gains (147.90 g/day) and the best feed conversion ratio of 6.20 can be recommended for growing Yankasa sheep. Therefore, this diet is recommended for growing Yankasa rams.

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