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COMPARATIVE FEEDING VALUE OF CYNODON DACTYLON AND DIGITARIA SMUTSII FORAGES SUPPLEMENTED WITH CONCENTRATE FOR WEANED FEMALE YANKASA LAMBS

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ABSTRACT

The study was conducted at the National Animal Production Research Institute Shika, Zaria, Nigeria to compare the feeding values of Bermuda *grass* (*Cynodon dactylon*) or Wooly finger grass (*Digitaria smutsii*) as basal diet on growth performance and some blood metabolites in weaned female Yankasa lambs. Twenty weaned female Yankasa lambs with an average body weight of 10± 2kg were randomly assigned to four treatments with five lambs per treatment in a randomized complete block design. They were fed with either *Cynodon dactylon* (treatments A and B) or *Digitaria smutsii* (treatments C and D) *ad-libitum*. Lambs in treatments A and C were supplemented at 1.00% of body weight (BW) while those in treatments B and D were supplemented at 1.50% BW. The concentrate was a mixture of maize (75.20%), cottonseed cake (23.80%), common salt (0.50%), and bone meal (0.50%). Feed intake, weight gain, nutrient digestibility and serum metabolites were determined. The result showed that there was no difference in the nutrient content of *Digitaria* and *Cynodon*, but the analysis of concentrate revealed a higher level of crude protein and lower levels of neutral and acid detergent fibers. The forage intake was higher in *Digitaria* but not significantly (P>0.05) different from *Cynodon*. There was an increase in concentrate intake as the level of supplementation increased. The same trend was observed with the total intake. Supplementation at 1.50% gave higher (P>0.05) total intake than at 1.00% supplementation. Daily weight gain was higher (P>0.05) with *Cynodon* supplemented at 1.50% BW than with *Digitaria* supplemented at 1.50% BW. *Cynodon* supplemented at 1.50% BW was found to be the most efficient and was significantly (P<0.05) different from *Digitaria* supplemented at 1.50% BW. The nutrient digestibility result also showed that lambs fed *Cynodon dactylon* were marginally higher than in lambs fed *Digitaria smutsii*, irrespective of the concentrate inclusion. Supplementation was found to increase the level of blood protein, albumin, and globulin. It was concluded from the study that *Cynodon dactylon* is a good forage substitute for *Digitaria smutsii* at a high supplementation level of 1.50%. It is hence recommended that *Cynodon dactylon* which is a native pasture available as weed in all the ecological zones of the country can be effectively used as forage for small ruminant production.

Keywords: *Cynodon dactylon, Digitaria smutsii*, Concentrate, Female, Lambs

INTRODUCTION

Small ruminant productivity in Nigeria has been characterized by low productivity. Several factors have been adduced to this; low reproductive characteristic, management system practiced, as well as high morbidity and mortality (Gefu, 2002; Aregawi *et al.*, 2013). The low productivity of livestock in Nigeria is associated with genetic, nutrition appears to be the most important factor since with poor nutrition, disease becomes a dominant

constraint. The low plane of nutrition in the country results from the seasonality and growth of natural herbage especially within the Sahel and Sudan savannah zones. This zones have the largest population of ruminant livestock in the country and are characterized by long dry which causes a decline in both quantity and quality of available grazing forage (Ogundupe, 2002; Franke *et al.*, 2011). However, grasses are the most abundant basal feed for small ruminant and livestock generally their palatability and digestibility vary with the specie and stage of maturity (Lakpini, 2002). To improve ruminant productivity farmers are increasingly relying on weeds as a potential feed source notably among these weed is *Cynodon dactylon* (Bermuda grass).It grows in open areas where there is frequent disturbances such as grassing and flooding, while Wooly finger grass (*Digitaria smutsii*) on the other hand is an improved forage from Australia. There is a poor intake of animal protein by Nigerians due to poor livestock productivity as a result of inadequate plane of nutrition. Therefore, this study was conducted to evaluate the nutritive value of native *Cynodon dactylon* on the performance of weaned Yankasa female lambs as well as to compare this with those of improved forage (*Digitaria smutsii*).

MATERIALS AND METHODS

The study was carried out at the National Animal Production Research Institute (NAPRI) Shika, Zaria, Nigeria on latitude $11^{o}12''$N and longitude $7^{o}33''$E on the altitude of 610m above sea level. Shika is within the Northern Guinea Savanna zone and has a sub humid tropical climate with an average annual rainfall of 1092mm, which fall mainly between April to October. The mean maximum temperature ranges from $27\text{-}35^{0}$C (I.A.R, 2005). Twenty female Yankasa lambs of an average weight of 10kg were used for this study. The animals were dewormed with levamisol intramuscularly at 1ml/10kg body weight at the commencement of the study. Ivax Veterinary Suspension^{R} was administered orally at 2ml/1kg, whenever indicated. The lambs were weighed and equally allotted to four treatment groups. Each animal was put into an individual feeding pen and at 08.00 hours each day given a weighed amount of appropriate concentrate (Conc) equivalent to 1% of its body weight for treatment groups A and C and 1.50% BW (body weight) for treatment group B and D. Groups A comprises of (*Cynodon* +1.00% BW Conc) ; B (*Cynodon* +1.50% BW Conc); C (*Digitaria* +1.00%BW Conc) and D (*Digitaria* +1.50% BW Conc) in a randomized design. The body weight was used for blocking before random allotment to treatment groups. Lambs were allowed 1 hour to eat the concentrate offered and fresh drinking water was provided to them *ad-libitum.*

After one hour *Cynodon dactylon* forage was offered to animals on treatments C and D *ad-libitum*. The leftovers of both the concentrate and the pastures were weighed the following morning to determine the daily intake of the animals. The animals were weighed regularly on a weekly basis before feeding to determine body weight changes in the course of the experiment. The feeding trial lasted 180 days to monitor the growth of the lambs. Two animals from each treatment were weighed on the first day of the digestibility trial and placed in individual metabolism crates. They were fed their respective rations for the first 14 days adjustment period. During the subsequent 7 days, feed and water offered, feed refusal fecal output and urine output collected in 5ml 0.1M H_2SO_4. Sample of feed, urine and feces were taken to for laboratory analysis to determine their proximate composition (AOAC, 2005). Neutral Detergent Fiber (NDF) and Acid Detergent fiber (ADF) were determined by the method of Van Soest (1995). Blood samples (5mls) from individual animals were collected from the jugular vein at the commencement of the study. The determination of serum metabolites was undertaken in the Clinical Chemistry Laboratory of the Ahmadu Bello

University Teaching Hospital, Zaria. The data collected were subjected to analysis of variance using general linear model (SAS, 2003), while the means were compared using Schaffer test at significance level of 0.05.

RESULTS

The chemical composition of the concentrate, *Digitaria* and *Cynodon* were presented in Table 1. The crude protein, ash and ether extract in *Digitaria* were marginally higher than those of *Cynodon*. However, the neutral detergent fibre and acid detergent fibre were marginally higher in *Cynodon* compared to those in *Digitaria*.

Table1: Chemical composition of the concentrate, *Digitaria* and *Cynodon* feed

	Chemical composition (%)					
Feed	**DM**	**ASH**	**EE**	**CP**	**NDF**	**ADF**
Cynodon dactylon	97.10	7.20	3.50	5.10	76.40	47.00
Digitaria smutsii	97.00	7.30	4.10	6.30	73.00	46.00
Concentrate	98.00	19.40	5.20	18.80	34.10	25.00

DM- Dry matter, EE-Either extract, CP-Crude protein, NDF-Neutral detergent fiber, ADF-Acid detergent fibre

Table 2 shows the comparative effect of feeding of *Cynodon dactylon* or *Digitaria smutsii* as basal diet on feed intake, weight changes and feed conversion efficiency in weaned female Yankasa lambs. It was observed that the intake was slightly higher in *Digitaria* but not significantly different (P>0.05) from *Cynodon*. The intake of concentrate was higher (P<0.05) in treatment with supplementation 1.00% BW. It was observed that the higher the level of supplementation the higher the intake. The total feed intake by lambs was the same for all the treatment. The highest (P<0.05) daily weight gain was recorded in lambs on *Cynodon* supplemented at 1.50% BW (body weight). The least daily weight gain was recorded for the other two treatment groups. *Cynodon* supplemented at 1.50% BW was found to be most efficient (P<0.05) and was significantly (P<0.05) different from *Digitaria* supplemented at 1.50% BW, while lambs supplemented forages at 1.00% BW recorded the least.

Table 3 shows the comparative effect of feeding of *Cynodon dactylon* or *Digitaria smutsii* as basal diet on nutrient digestibility in weaned female Yankasa lambs. Nutrient digestibility in lambs fed *Cynodon dactylon* were marginally higher than in lams fed *Digitaria smutsii*, irrespective of the concentrate inclusion.

The comparative effect of feeding of *Cynodon dactylon* or *Digitaria smutsii* as basal diet on serum metabolites in weaned female Yankasa lambs is presented in table 4. The total protein level increased (P<0.05) and almost doubled with an increased level of supplementation. Treatment B and D which had 1.50% level of supplementation, had twice the total protein content than treatment A and C. similarly, the albumen level also increased (P<0.05) with increased level of supplementation as treatment B and D with 1.50% level of supplementation had higher than treatment A and C. The globulin level also showed a similar pattern. Those treatments with high level of supplementation had higher (P<0.05) values of globulin.

Table 2: Comparative effect of feeding of *Cynodon dactylon* or *Digitaria smutsii* as basal diet on feed intake, weight changes and feed conversion efficiency in weaned female Yankasa lambs.

Treatment	Forage intake (kg)	Concentrate intake (kg)	Total dry matter intake (kg)	Weight gain (g/day)	Feed conversion Efficiency
Cynodon dactylon + 1.00 % B.W Concentrate	98.00	21.00^{b}	119.00	22.00^{c}	28.00^{b}
Cynodon dactylon + 1.50 % B.W Concentrate	97.00	27.00^{a}	123.00	49.00^{a}	15.00^{c}
Digitaria smutsii + 1.00 % B.W Concentrate	102.00	21.00^{b}	123.00	17.00^{c}	42.00^{a}
Digitaria smutsii + 1.50 % B.W Concentrate	99.00	25.00^{c}	123.00	36.00^{b}	21.00^{bc}
SEM	2.40	1.40	2.70	4.30	4.40

^{abc}Means with different superscripts along the column differed significantly (P<0.05), B.W = body weight
SEM = Standard Error of Mean

Table 3: Comparative effect of feeding of *Cynodon dactylon* or *Digitaria smutsii* as basal diet on nutrient digestibility in weaned female Yankasa lambs.

	Nutrient digestibility (%)					
	DM	ASH	EE	CP	NDF	ADF
Cynodon dactylon +1.00 % B.W Concentrate	39.20	47.10	30.30	35.40	42.10	42.20
Cynodon dactylon + 1.50 % B.W Concentrate	44.80	59.10	32.20	39.40	49.30	53.10
Digitaria smutsii + 1.00 % B.W Concentrate	45.70	60.90	27.30	47.40	47.30	40.40
Digitaria smutsii + 1.50 % B.W Concentrate	49.00	60.30	32.10	48.20	57.30	56.30

DM- Dry matter, EE-Either extract, CP-Crude protein, NDF-Neutral detergent fiber, ADF-Acid detergent fibre
B.W = body weight

Table 4: Comparative effect of feeding of *Cynodon dactylon* or *Digitaria smutsii* as basal diet on serum metabolites in weaned female Yankasa lambs.

	Serum metabolites (mmol/l)		
Treatment	**Total protein**	**Albumin**	**Globulin**
Cynodon dactylon + 1.00 % B.W Concentrate	12.00[b]	8.00[b]	13.00[c]
Cynodon dactylon + 1.50 % B.W Concentrate	26.00[a]	11.00[b]	19.00[a]
Digitaria smutsii + 1.00 % B.W Concentrate	11.00[b]	10.00[b]	15.00[bc]
Digitaria smutsii + 1.50 % B.W Concentrate	24.00[a]	16.00[a]	26.00[a]
SEM	2.90	1.90	2.50

[abc]Means with different superscripts along the column differed significantly (P<0.05), B.W = body weight
SEM = Standard Error of Mean

DISCUSSION

The level of nutrient in both forages was because; the study was conducted during the rainy season, when the pastures are of highest quality in the sub humid climatic zone. Neutral detergent fiber and acid detergent fiber are the main indicators of forage quality and influence consumption, energy density, milk production, animal health, and feed cost (Christensen *et al*., 2015). A safe upper limit of 60% neutral detergent fiber level for guaranteed forage intake by ruminant (Meissner *et al.*, 1991). The neutral detergent fiber and acid detergent fiber values were within the range of that will meet small ruminant nutrient requirement (Christensen *et al*., 2015). Adequate fibre in the diet of ruminants is needed so as to aid rumen microorganisms to perform optimally (Ojo, 2017). This is necessary to lead to the production of volatile fatty acids (Lamidi and Ogunkunle, 2016).

The slightly higher intake of *Digitaria* as compared to *Cynodon* might be due to the sward structure of *Digitaria* such as leaf height and leaf stem^{-1} ratio exerting direct effect on the process of ingestion and consumption of forage, thereby affecting the forage intake by the animal (Gonçalves *et al*., 2009). The concentrate intake was higher in lambs fed *Cynadon* supplemented at 1.5% BW concentrate. This shows that, the higher the level of supplementation, the higher the intake. Similarly, the work of Singh *et al.,* (2016) showed that feeding of concentrate to grazing animals not only add directly to the total feed intake but also stimulate the intake of low quality forage. Daily weight gain was highest in *Cynodon* + 1.50% BW supplementation. The weight gain in these treatments indicated that feeding of roughage and concentrate portions provide all the nutrients in required proportions, thus improve performance of dairy animals as reported by Venkateswarlu *et al*., 2013. The author also reported a significant effect on growth rate and feed conversion efficiency in lambs fed crop residue-based complete ration in comparison to traditional grazed animals (48.5 g/day) with no concentrate supplementation. However, the result also explained the fact that supplementing *Cynodon* with concentrate can result in weight gain better than *Digitaria.*

The digestibility within treatments on 1.5% supplementation also followed a similar pattern. Animals with high level of supplementation had higher levels of digestible nutrients than 1% supplementation (A and C). This also agrees with the work of Orskov, (1994) who stated that digestibility of diets tended to be increased by supplementation. The most probable

explanation for this phenomenon is in the fact that 1.50% supplementation diet might result in high palatability, increased activity of rumen microorganisms for rapid fibre digestion in the rumen and better utilization of the nutrients by lambs. The improvement in digestibilities of nutrients in response to legume supplementation is in line with the reports of Nsahlai and Umunna (1996).

Serum metabolites were within the normal physiological ranges in all the lambs with no alterations in protein utilization (Khan *et al*., 2016). Roughage is a good feed source for kid production if fortified appropriately with concentrate feeds, resulting no change in their hemogram (Tripathi *et al*., 2014). This was further supported by Santra *et al.,* (1999) in experiment with cross calves with 60% and 30% contrite supplement reported that the total protein albumin and globulins remained unchanged in all groups. This is in contrast to our findings, as we observed that with increased level of supplementation there was an increase in the total protein, albumin and globulins.

CONCLUSION AND RECOMMENDATION

It was concluded from the study that, *Cynadon dactylon* is a good forage substitute for *Digitaria smutsii* at high concentrate supplementation level of 1.50%. It is therefore recommended that *Cynadon dactylon* which is native forage available as weed in all ecological zones of the country can be effectively produced and used as forage for small ruminant production.

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