PERFORMANCE OF YANKASA SHEEP FED *Panicum maximum* SUBSTITUTED WITH VARYING LEVELS OF *Gmelina arborea* FORAGE

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ABSTRACT

A study that involved fifteen (15) Yankasa sheep aged 2-3 years and weighed 9.24 ± 0.15Wkg$^{0.75}$ were used to assess the nutritive value of *Panicum maximum* substituted with varying levels of *Gmelina. arborea* forage. The experiment was conducted at the Teaching and Research farm, Federal University of Technology, Akure. Five diets were formulated as follow; 100% *Panicum maximum* (A), 75% *Panicum maximum* + 25% *Gmelina arborea* (B), 50% *Panicum maximum* + 50% *Gmelina arborea* (C), 25% *Panicum maximum* + 75% *Gmelina arborea* (D), 100% *Gmelina arborea* (E).The fifteen sheep were divided into five groups (three replicates per group) in a completely randomized design (CRD and fed the experimental diets for 63 days. Feed and water were provided *ad libitum* and routine vaccination and medication were administered. The parameters measured were nutrients intake, digestibility, weight gain, nitrogen retention and feed/gain ratio. Chemical composition revealed that crude protein (10.35-23.33%) and energy (15.69-16.69KJ/100gDM) contents were adequate to support the performance of the sheep. The crude fibre contents decreased with increased crude protein contents of the diets. The results showed that the daily dry matter intake increased with improved crude protein quality of the diets. There were significant ($P<0.05$) differences among the digestibility coefficients of sheep fed experimental diets. The sheep fed diet D had better and improved voluntary nutrients intake, daily liveweight gain and feed/gain ratio. Thus, the high nutrients values of *Gmelina arborea* leaves coupled with its palatability and acceptability to the sheep fed the diet that contained 75% *Panicum maximum* + 25% *Gmelina arborea* forage could be a source of energy and protein to sustain ruminant production during the scarcity and dry season period.

INTRODUCTION

The major constraint to livestock production in developing countries is the scarcity, roughages quantity and quality of year round forage supply. Dixon and Egan (1987) reported that during the dry season, the natural pastures and post harvest crop residues are usually fibrous and devoid of most essential nutrients which are required for improved microbial fermentation and improved performance of host animal. This manifest in loss of weight and condition, reduced reproduction capacity and increase mortality rate. Hence the need for alternative feed resources to improve the productivity of livestock industries.Nutritive value of a forage refers to its chemical composition, digestibility and the nature of digested products. The amount of forage consumed by the animal is very important, as it affects total nutrient intake and therefore the animal's response (Oyenuga, 1968). *Panicum maximum* (Guinea grass) is a high yielding perennial forage predominant in the humid tropics. It responds well to increased fertilization and good management. It grows to a range height of about 1.00 to 1.5m. Grazing animals especially cattle, sheep and goats relish this forage because of its reasonable quality. *Gmelina arborea* timber is multi-purpose tree plants, notable for its lightweight, stability and durability. *Gmelina arborea* leaves are considered good for cattle (crude protein – 11.9%) and are also used as a feed to eri-silkworm. The study was therefore, designed to evaluate the performance of Yankasa sheep fed *Panicum maximum* substituted with varying levels of *Gmelina arborea* forage.

MATERIALS AND METHODS

The study was carried out at the Small Ruminants Unit of the Teaching and Research Farm and Central Laboratory unit of Federal University of Technology, Akure (FUTA), Ondo State. *Panicum maximum* and *Gmelina arborea* were harvested from the established grass pasture and *G. arborea* plantation of the T&R farm This was done every evening to cure the leaves before feeding in the next morning. Five diets were formulated such that *Panicum maximum* was substituted with *Gmelina arborea* as follow: A (100% *Panicum maximum*),

B (75% *Panicum maximum* and 25% *Gmelina arborea*), C (50% *Panicum maximum* and 50% *Gmelina arborea*), D (25% *Panicum maximum* and 75% *Gmelina arborea*) and E (100% *Gmelina arborea*). Fifteen (15) Yankasa sheep of live weight ranged; 9.24 ± 0.15Wkg$^{0.75}$ selected from small ruminants unit T&R farm were used for this study. The sheep were randomly assigned to the five dietary treatment groups (3 sheep per treatment) in a completely randomized design. The sheep were fed the experimental diets at the rate of 3.5% per kilogram body weight and fresh water was supplied *ad libitum* daily at 8.00am. The feeding trial lasted sixty three (63) days excluding 7 days of adaptation period. The last fourteen days of the experimental period were used for the digestibility trial. The feed intake and weight changes of the sheep were determined and recorded accordingly. The samples of feed, faeces and urine were analyzed for dry matter and dietary nutrients respectively according to the methods of (AOAC, 2000). Neutral detergent fibre and acid detergent fibre were determined using the analytical procedure of Van Soest *et al.* (1991). All data obtained were subjected to analysis of variance (ANOVA) and treatment means were compared by the statistical method of Duncan (1955).

RESULTS AND DISCUSSION

The result of chemical composition presented in Table 1 showed that the dry matter content of the diets ranged between 92.29 (diet D) and 94.94% (diet E), the values were higher than 17.89-71.29% reported by Bamikole *et al.* (2004). The crude protein (CP) value (10.35%) observed in *P. maximum* diet was higher than 7.20-7.68% reported for the grass by (Ajayi, 2012). The crude fibre (CF) contents of the experimental diets were lower than the average CF content (20.82%) reported by Mecha and Adegbola (1980) when chemical composition of forage fed to goats in southern Nigeria was evaluated. The Neutal detergent fibre (NDF) and Acid detergent fibre contents of the experimental diets were lower than obtained value of Fajemisin *et al.* (2012) when West African Dwarf goats was fed *Panicum maximum* and urea treated *Cajanus cajan* haulms silage. The nutrients intake by the sheep fed the *P. maximum* substituted with *G. arborea* (Table 2) was significantly (P<0.05) influenced by the treatment. The improved feed intake observed could be attributed to protein quality, low fibre content (Table 1), palatability and acceptability of the diets. The dry matter intake values were higher than 212.05-236.59g/day reported by Akinyemi *et al.* (2010) when *P. maximum* supplemented with *Moringa oleifera* was fed to WAD sheep. Crude protein intake of sheep fed diet D was the highest value (147.68 g/Wkg$^{0.75}$) and the obtained values were favourably compared to the values reported by (Fajemisin *et al.*, 2012). The CF, NDF and ADF intake by sheep fed diets B, C, D and E decreased with increased substitution of *G arborea* in the diets, this observation might be attributed to the decreased fibre contents and increased protein contents of these diets. The results of the nutrients apparent digestibility coefficients, daily weight gain, feed/gain ratio and nitrogen retention were presented in Table 3. Dry matter digestibility coefficient ranged between 70.10 (diet A) and 75.89% (diet D). This observation did not agreed with the earlier report of 78-80% DM digestibility (Hadjipanayiotou, 1990) when weaned lambs and kids were fed processed grain based diets. The CP, CF and NDF digestibility values increased with increased substitution levels of *G. arborea* in the diets however, the sheep fed diet D had highest nutrients digestibility coefficients except the ether extract and energy. The daily weight gain values (41.73 – 73.54g) observed in this study are lower than 84.90 - 94.00g/d as reported by Olomola *et al.* (2008). Nitrogen retention in g/Wkg$^{0.75}$ was best in sheep fed diet C, this observation might be attributed to protein quality of the diets and available dietary microbial protein in the small intestine of the sheep. The highest weight gain (19.05g/Wkg$^{0.75}$/day) was recorded for sheep fed diet D. The feed/gain ratio was significantly (P<0.05) influenced by the treatment and the sheep fed diet D converted their feed to flesh better than other sheep.

Conclusion

The results obtained in this study revealed that *Panicum .maximum* substituted with varying levels of *Gmelina. arborea* no doubt improved the protein content of the diets, nutrients intake and utilization by the sheep. The sheep that fed diet D had better and improved voluntary dry matter and nitrogen intake, daily live weight gain and feed/gain ratio than other sheep. Thus, the combination of *P. maximum* and *G. arborea* in different proportions have a good nutritional

potentials to sustain ruminants production during the scarcity and dry season period.

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Table 1: Chemical composition of *Panicum maximum* substituted with *Gmelina arborea* diets fed to WAD sheep

Parameters	Diets						
	A	B	C	D	E	SD	CV%
Dry matter	94.21	94.39	93.01	92.29	91.94	2.41	2.58
Crude protein	10.35	20.53	22.60	22.66	23.33	5.18	25.04
Crude fibre	25.55	23.28	18.15	15.26	10.21	5.84	31.58
Ether extract	9.48	5.61	10.39	12.22	10.86	2.40	24.72
Ash	8.78	7.90	7.64	7.67	8.73	0.80	9.83
Nitrogen free extract	40.05	37.07	34.23	34.48	38.81	2.81	7.61
Neutral detergent fibre	27.36	25.50	22.37	19.56	15.65	4.71	21.32
Acid detergent fibre	21.33	19.65	18.74	15.46	12.79	3.35	19.04
Gross energy (KJ/100gDM)	16.25	15.69	16.43	16.69	16.65	2.00	12.24

Table 2: Nutrients intake (g/kgW$^{0.75}$) of WAD sheep *Panicum maximum* substituted with *Gmelina arborea* diets

Parameters	Diets					
	A	B	C	D	E	SEM
Dry matter	409.74^{b}	666.29^{a}	644.29^{a}	651.74^{a}	432.20^{b}	30.89
Crude protein	42.41^{d}	136.79^{b}	145.61^{a}	147.68^{a}	100.83^{c}	0.23
Crude fibre	104. 69^{c}	155.11^{a}	116.94^{b}	99.46^{d}	44.13^{e}	9.56
Ether extract	42.00^{d}	37.53^{e}	66.88^{b}	79.64^{a}	46.94^{c}	4.30
Ash	35.97^{d}	52.62^{b}	49.22^{c}	57.22^{a}	37.73^{d}	2.26
Nitrogen free extract	164.10^{c}	246.99^{a}	220.54^{b}	224.72^{b}	167.74^{c}	9.00
Neutral detergent fibre	112.10^{d}	169.90^{a}	144.13^{b}	127.48^{c}	66.82^{e}	9.22
Acid detergent fibre	87.40^{d}	130.93^{a}	120.74^{b}	102.00^{c}	55.27^{e}	7.13
Gross energy (KJ)	66.58^{b}	104.54^{a}	105.86^{a}	108.78^{a}	71.96^{b}	4.94

a, b,c,d,e: Means within the same row with different superscripts are significant (P<0.05)

Table 3: Nutrients digestibility coefficients (%), daily weight gain, feed/gain ratio and nitrogen retention of WAD sheep *Panicum maximum* substituted with *Gmelina arborea* diets

Parameters	Diets					
	A	B	C	D	E	SEM
Dry matter	70.10^{b}	74.49^{ab}	75.36^{ab}	75.88^{a}	75.89^{a}	0.86
Crude protein	68.72^{b}	78.42^{a}	79.47^{a}	79.58^{a}	79.58^{a}	1.82
Crude fibre	60.25^{b}	74.38^{a}	75.38^{a}	75.53^{a}	75.58^{a}	1.69
Ether extract	62.85^{c}	67.56^{b}	70.58^{b}	74.53^{a}	74.71^{a}	1.28
Nitrogen free extract	51.65^{c}	60.24^{bc}	69.46^{ab}	74.33^{a}	71.78^{ab}	2.69
Neutral detergent fibre	54.51^{c}	67.19^{b}	75.98^{a}	76.36^{a}	76.38^{a}	2.31
Acid detergent fibre	71.96^{b}	75.90^{a}	75.52^{a}	75.76^{a}	76.08^{a}	0.46
Gross energy (KJ)	62.71^{b}	70.73^{b}	73.76^{a}	76.18^{a}	76.57^{a}	1.40
Daily weight gain (g/Wkg$^{0.75}$)	5.42^{b}	16.03^{a}	15.87^{a}	19.05^{a}	5.76^{b}	1.62
Feed gain ratio	25.63^{a}	16.37^{b}	16.08^{b}	14.15^{b}	16.46^{b}	1.14
Nitrogen retention (g/Wkg$^{0.75}$)	1.50^{d}	7.02^{b}	8.09^{a}	7.20^{b}	5.84^{c}	0.63

a, b,c,d,e: Means within the same row with different superscripts are significant (P<0.05) different.