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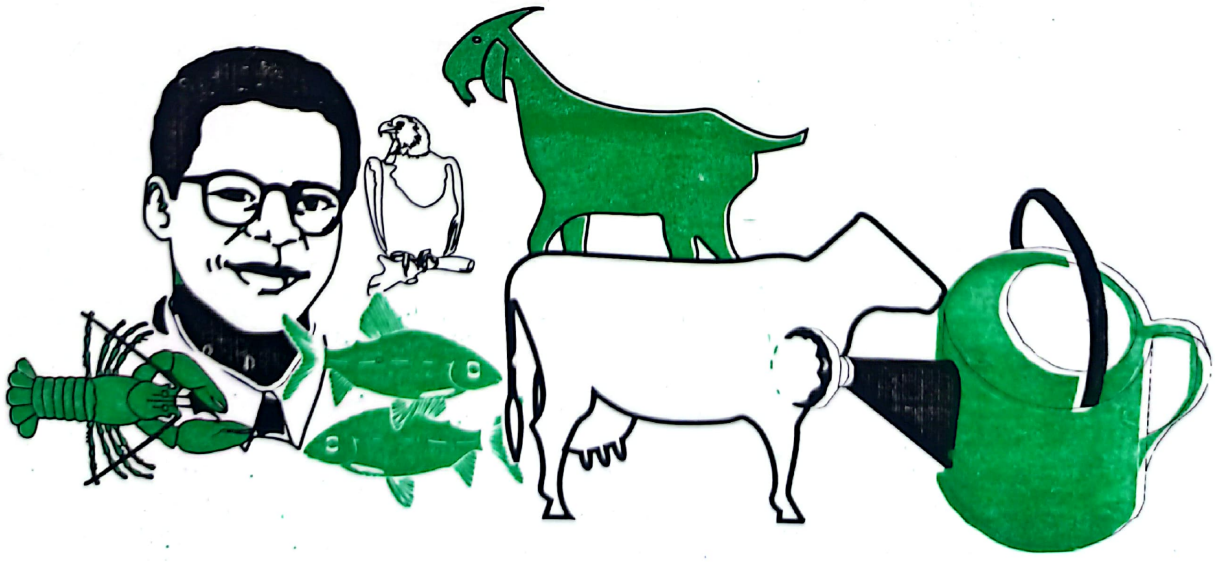

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PERFORMANCE OF LOCAL (YANKASA) RAMS FED DIETS CONTAINING VARYING LEVELS OF *Gmelina arborea* LEAVES (GML) AND *Desmodium* FORAGE (DF) SUPPLEMENTED WITH CONCENTRATE.

BY

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ABSTRACT

A feeding trial was conducted to evaluate the performance of Yankasa rams fed diets containing varying levels of *Gmelina arborea* (GmL) leaves and *Desmodium* foliage (DF) supplemented with concentrate for a period of 56 days. Sixteen (16) Yankasa rams, with an average age of 18 months and initial mean body weight of 18 kg were used in a completely randomized design experiment. The animals were alloted to 4 treatments (T_1, T_2, T_3 and T_4) containing *Desmodium* and *Gmelina* at 100: 0%, 25:75%, 75:25 % and 0:100 % levels respectively .Mean feed intake was significantly ($p<0.05$) higher for animals in T_4 (0.47±0.04 kg) and T_2 (0.45 ± 0.03 kg) than for those in T_1 (0.42 ± 0.03 Kg) and T_3 (0.43± 0.03 kg). Similarly, final live body weight gain (FLBWG) was significantly better ($P < 0.05$) in T_4 (2.95 ± 0.15 kg) and T_2 (2.50 ± 0.12 kg) than in T_1 (1.50 ± 0.02 kg) and T_3 (1.75 ± 0.08 kg). The lower Total Ash (TA) content (4.70 %) observed in T_4 appeared to have enhanced higher digestibility in T_1 (96.03%). The result of this study suggests that Yankasa rams, when offered liberal concentrate supplement with 100% level of inclusion of *Gmelina* leaves, or a combination of 25 % *Desmodium* and 75 % *Gmelina* inclusion in the ration, would give satisfactory performance.

Keywords: Yankasa Rams, *Gmelina arborea* leaves, *Desmodium* forage, Concentrate, Performance.

INTRODUCTION

Animal production in many parts of the tropics and sub – tropics is generally limited by both protein and energy deficiencies in the animals diet. Such deficiencies are particularly prominent in regions where evergreen forages have not been freely offered in livestock rations, inspite of their potential, availability and occurrence of feed scarcity. A study of the livestock feed situation in Nigeria reveals serious supply deficit, which has largely contributed to the crises in the nation's livestock production system (ARC., 1991). This situation has certainly led to the slow pace of livestock production in those regions, Nigeria inclusive (Shiawoya and Olatunji., 1994). In the case of Nigeria, the seasonal fluctuations or variations in the availability and nutrients value of Nigeria's natural pastures further contribute to the declining productivity of Nigeria's livestock, especially ruminants. Fortunately, however, browse plants, shrubs and herbs, which are able to maintain reasonable protein content, and are fairly digestible throughout the year, are available in Nigeria. Examples of such plants that can be offered as livestock feed include *Gmelina arborea* and *Desmodium* forages. *Gmelina arborea* plant (which belongs to the *Verbenaceae* family) is a popular fast- growing browse tree frequently planted in plantations to produce wood for light construction, pulp, fuel and charcoal. However, its leaves and fruits are also relished by livestock, especially in Nigeria and many parts of India (Shiawoya, 1999; Hossain, 1999). *Desmodium* foliage, on the other hand, is a perennial forage crop with deep tap root system and round narrow leaves. It belongs to the *Fabaceae* family, medium in height and quite abundant in the tropics. The forage was highly palatable when grazed by livestock, while the meal is an excellent source of protein, riboflavin and vitamin A for poultry (Adu and Adamu, 1982).

This study was therefore to determine the effect of feeding varying levels of *Gmelina arborea* leaves and *Desmodium* foliage with liberal amounts of concentrate to local Yankasa rams.

MATERIALS AND METHODS

perimental Site.

The study was conducted in the feedlot unit of the Teaching and Research farm of the School Agriculture and Agricultural Technology, Federal University of Technology, Minna, Nigeria. The e is situated in the Southern Guinea Savannah zone on latitudes 9^0 31' and 9^0 42' North and ngitudes 6^0 29' and 6^0 41' East, with annual rainfall range of 1,200 – 1,300 mm and temperature nge of 38^0 – 40^0C. The area has an altitude of 1, 475 m above sea level, and is characterized by two asons, the wet season (April- October) and the dry season (November – March) (NSADP, 1995).

lanagement of the Animals

Sixteen (16) local Yankasa rams weighing between 17 – 19kg and with a mean age of 18 onths, were used for the study. Prior to introducing the animals into the unit, the pens were oroughly cleaned and disinfected. Wood shavings were spread in the pens, as bedding, to a ickness of 5cm. The animals were dewormed with Albendazole (2 ml/10kg BW), while)xytetracycline was administered intramuscularly (1 ml/10kg BW) against bacterial infection. The nimals were housed in their respective treatment pens and allowed 7 days adaptation to the diet and en environment. During feeding, the forage and concentrate portions were offered separately. lowever, while concentrate was offered liberally, roughage was given at the rate of 2.50% of body veight in accordance with group requirement, and as recommended by Aduku (2004).

The feeds were offered between 7.00 and 8.00 hr (forage portion) and 15.00 to 16.00hrs (concentrate portion). Feed refusals were weighed the following morning before offering fresh feed. This was used to determine voluntary feed intake for both the forage and concentrate. The animals had free access to both water and salt licks. Tables 1 and 2 show the composition of both concentrate and the forage portions of the diets.

Table 1:Composition of the concentrate portion of the diet

Ingredients	Percentage (%)
Maize	46.75
Maize bran	45.40
Groundnut cake	4.85
Bone meal	2.00
Vitamin mineral premix *	0.50
Salt	0.50
Total	100.00

* Supplied per kg diet: 800 IU vitamin A: 1200 IU vitamin D3; 13 mg vitamin E; 2 mg vitamin k; 3 mg riboflavin; 10 mg cobalamin; 1.5 mg folic acid; 0.25 mg biotin; 125 mg antioxidant (satoquin); 25 mg Fe, 80 mg Mn; 50 mg zn; 2 mg Cu; 0.2 mg Co; and 0.1 mg Se.

Table 2: Composition of the forage portion of the diets (%)

	Treatments			
Forage	T_1	T_2	T_3	T_4
Desmodium forage (DF)	100	25	75	0
Gmelina Leaves(GmL)	0	75	25	100
Total	**100**	**100**	**100**	**100**

Experimental design and feeding trials

A completely randomized design (CRD) was used. The 16 sheep were randomly allotted to 4 diet treatments (T_1, T_2, T_3 and T_4) containing *Desmodium* and *Gmelina* forage at 100:0 %, 25 : 75 %, 75 : 25 %, and 0: 100 % levels respectively. Each treatment had 4 animals, replicated twice, with 2 animals per replicate. There were two feeding trials. These were the growth study and digestibility trial. The growth study lasted for 56 days, preceded by a 7-day preliminary period. The animals were weighed at the beginning of the experiment, and weekly thereafter, to assess live weight changes. At the end of the experiment, a 5 –day digestibility trial was conducted with 8 animals, one from each replicate. These were housed in separate wooden metabolic cages with facilities for feeding, watering and collection of faeces. The animals were weighed at the beginning and at the end of the collection period. Faecal out-puts from each animal were collected for 5 days following the standard procedure(Aina, 1996). About 10% of the total faecal out-put were labelled and stored in a freezer for analysis at the end of the trial as described by AOAC (1995).

Proximate analysis

Samples from the experimental feeds were oven dried at 105^{0}C to constant weight for dry matter determination (AOAC, 1995). The dried samples were then ground in a laboratory hammer mill to pass through a 1mm sieve and then analyzed for crude protein (CP), Crude fibre (CF), ether extracts (EE) and ash, according to AOAC (1995).

Statistical analysis

Data obtained were subjected to one-way analysis of variance (ANOVA) (Steel and Torrie 1980). Significant differences between treatment means were separated by Duncan Multiple Range test (Duncan, 1995)

RESULTS AND DISCUSSION

Proximate composition

The result of the proximate composition of the forage and concentrate constituents of the diet is shown in Table 3. Dry matter (DM) Content was generally high, ranging from 89.80% in concentrate to 96.80% in *Gmelina* leaves. The CP content was also highest (14.70%) in GmL, intermediate (10.50 %) in concentrate, and least (8.40 %) in DF. Except for GmL, the CP contents were below the optimum (14.50 %) recommended for growing lambs (Aduku, 2004). Table 4 shows the proximate composition of the treatment diets. Table 4 also shows that all the diets had high DM contents, ranging from 92.70 % in T_1 (DF) to 93.30 % in T_4 (GmL). All the diet components in Tables 1 to 4 were sun – cured prior to use, which could have accounted for the high DM obtained. It was observed from Table 4 that T_2 and T_4 which had higher proportions of GmL also gave similar and higher contents of DM, CP, EE and TA than T_1 and T_3, which had higher proportions of DF in the diet. However, CF and NFE contents of T_1 and T3, which had higher proportions of DF were also similar and higher than those of T_2 and T_4. Except for NFE, all the values of the nutrient contents of the concentrate were lower than those of GmL, but comparable with those of DF, except for CF and NFE (Table 3). The CP content (14.70 %) of GmL obtained in this study was higher than that reported (10.88 %) by Shiawoya (1999) in a similar study. The values of the nutrient contents of both GmL and DF obtained in the trial could have been influenced by differences in age and time or season of harvest of the forages.

Table 3: Proximate composition of forage and concentrate constituents in the diet (%)

Nutrients	*Gmelina* Leaves (GmL)	*Desmodium* forage (DF)	Concentrate
Dry matter (DM)	96.80	95.60	89.80
Crude protein (CP)	14.70	8.40	10.50
Crude fibre (CF)	45.42	54.14	3.96
Ether extracts (EE)	13.00	9.00	11.50
Total ash (TA)	8.00	5.56	4.00
Nitrogen free extract (NFE)	18.88	22.90	70.04

Table 4: Proximate composition of forage mixture + concentrate in the diets (% DM)

Nutrients	Treatments			
	T_1	T_2	T_3	T_4
Dry matter (DM)	92.70	93.15	92.85	93.30
Crude protein (CP)	9.65	11.82	10.24	12.60
Crude fibre (CF)	29.05	25.79	27.97	24.69
Ether extracts (EE)	10.25	11.75	10.75	12.25
Total ash (TA)	4.78	5.70	5.09	6.00
Nitrogen free extract (NFE)	46.27	45.15	46.16	44.66

T_1 = 100% *Desmodium* forage + concentrate
T_2 = 25% *Desmodium* forage + 75% Gmelina leaves + concentrate
T_3 = 75% *Desmodium* forage + 25% Gmelina leaves + concentrate
T_4 = 100% *Gmelina* leaves + concentrate

Nutrient digestibility

The digestibility of nutrients in Yankasa rams fed the experimental diets is as shown in Table 5. Nutrient digestibility was generally high, probably due to the liberal supply of concentrate in the diet, which could have enhanced rumen microbial activities(Shiawoya *et al.*,2000). Except for CF, digestibility of all nutrients was slightly higher in DF + concentrate diet(T_1) than GmL + concentrate diet (T_4). This is probably due to lower content of most of these nutrients in DF (Table 3), and the possibility that these nutrients are more readily degradable by the rumen micro-organisms in the presence of high level of soluble carbohydrates (Orskov and Ryle, 1990).

Mc Donald *et al.*(1995) have stated that high digestibility also often promotes high intake of feed, as observed in this study, since fast rate of digestion creates more space in the gut for subsequent feed intake. The slightly higher digestibility of DM in T_1 (96.03 %) could have been influenced by the lower Total Ash (TA) content (4.7 %) in the treatment diet (Table 4), which would have less interfering effect on digestibility (Taiwo *et al.*, 1995). Mc Allan (1991) reported that maximum dietary CF digestion in the rumen occurs when dietary CP is between 12 to 16 %. In this study, however, CF digestibility in all treatments was found to be very high, even though CP content of the diets ranged from 9.65 to 12.60 % (Table 4). This probably indicates some measure of feed quality, which is a function of the nutritive value and level of feed intake, as measured by animal performance (Preston and Leng., 1987).

Table 5: Apparent digestibility coefficient (ADC. %) of diet consisting of various combinations of *Gmelina* leaves and *Desmodium* forage.

Treatments	DM	CP	CF	EE	TA	NFE
T1	96.03	88.66	96.75	94.34	92	90.86
T2	95.62	90.02	96.43	94.45	91.83	90.91
T3	94.40	85.47	95.05	93.09	98.62	91.85
T4	95.31	88.64	97.41	93.27	89.08	88.18

KEY :

DM : Dry Matter, CP : crude protein, CF : crude fibre, EE : Ether Extract : TA : Total Ash , NFE : Nitrogen Free Extract.

T_1 = 100% *Desmodium* forage + concentrate

T_2 = 25% *Desmodium* forage + 75% *Gmelina* leaves + concentrate

T_3 = 75% *Desmodium* forage + 25% *Gmelina* leaves + concentrate

T_4 = 100% *Gmelina* leaves + concentrate

Table 6. Performance characteristics of Yankasa rams fed different combinations of concentrates, *Gmelina* and *Desmodium*

Parameters	Treatments			
	T_1	T_2	T_3	T_4
Initial live body weight (ILBW) (Kg)	19.50	18.75	19.50	19.25
Final live body weight (FLBW) (Kg)	20.50 ± 3.22^{bc}	21.25 ± 3.35^{b}	21.25 ± 3.32^{b}	22.20 ± 3.60^{a}
Final live body weight gain (FLBWG) (Kg)	1.50 ± 0.02^{b}	2.50 ± 0.12^{ab}	1.75 ± 0.08^{b}	2.95 ± 0.15^{ab}
Weekly live body weight gain (WBWG) (Kg	0.12 ± 0.01^{b}	0.31 ± 0.02^{a}	0.22 ± 0.01^{b}	0.37 ± 0.02^{a}
Weekly feed intake (WFI) (Kg)	0.42 ± 0.03^{b}	0.45 ± 0.03^{a}	0.43 ± 0.03^{bc}	0.47 ± 0.04^{a}
Feed conversion ratio (FCR	3.52 ± 0.21^{b}	1.40 ± 0.06^{a}	1.94 ± 0.07^{a}	1.26 ± 0.04^{a}

a,b,c Means along the same row bearing different superscript letters differ significantly ($P<0.05$)

* Significant at 5 % level

LS – Level of significance

T_1 = 100% *Desmodium* forage + Concentrâte

T_2 = 25% *Desmodium* forage 75% *Gmelina* leaves + Concentrâte

T_3 = 75% *Desmodium* forage 25% *Gmelina* leaves + Concentrâte

T_4 = 100% *Gmelina* leaves + Concentrâte

Performance Characteristics

Data on performance characteristics of the experimental animals are presented in Tables 6. Weekly feed intake was significantly ($P<0.05$) higher for animals in T_4 (0.47 ± 0.04kg) and T_2 (0.45 ± 0.03kg) than for those in T_1 (0.42 ± 0.03kg) and T_3 (0.43 ± 0.03kg). It was also observed that final live body weight gain (FLBWG) was better ($P<0.05$) in T_4 (2.95± 0.15kg) and T_2 (2.50±0.12kg) than in T_1(1.50 ± 0.02kg) and T_3 (1.75 ± 0.08kg).

The higher feed intake on GmL (sole browse) could be due to the stimulatory effect associated with browse plants (Moran *et al.*,1983; Chesworth, 1992; Shiawoya and Olatunji, 1994). The enhanced palatability and lower CF content (24. 69%) of GmL in T_4 could have also promoted the rate of passage of rumen digesta through the gut, thereby stimulating increased intake (Moran *et. al.*, 1983; Shiawoya *et. al,*. 2001). of rumen digesta through the gut, thereby stimulating increased intake (Moran *et. al.*, 1983; Shiawoya *et. al,*. 2001)

Final live body weight gain (FLBWG) was also observed to be highest (2.95 ±0.15kg) for animals in T4. This was significantly different ($P<0.05$) from values obtained for T_1 (1.50 ± 0.02kg) and T_3 (1.75 ± 0.08Kg), but statistically similar to T_2 (2.50 ±0.12kg). These results appear to reflect the influence of DM intake. The same trend was observed for FCR. Eniolorunda and Rowaiye (2008) have indicated that the closer the FCR is to 1, the more desirable the diet, since the animal consumes less feed to produce a unit weight gain and vice versa.

CONCLUSION AND RECOMMENDATIONS

The overall observation from this study shows that feeding 100% *Gmelina* leaves, or a combination of 25% *Desmodium* foliage and 75% *Gmelina* leaves, with liberal amount of concentrates in the diets (T_4 and T_1) of Yankasa rams will enhance their performance. Such rations can, in fact, ameliorate body weight losses in sheep, especially during the dry season, in Savanna zones of Nigeria where these plants are readily available.

REFERENCES

Adu, I. F. and Adamu A. M. (1982). The Nutritive value and Utilization of three tropica grass hay by sheep. *Tropical Grassland, 16: 29 – 33*

Aduku, A. O. (2004). Animal Nutrition in the Tropics. Feeds and Feeding, Pasture management, Monogastric and Ruminant Nutrition. Davcon computers and Business Bureau, Samaru, Zaria Pp. 139 – 140.

Aina, A.B.J (1996). Performance of female West African Dwarf (Fouta Djallon) goats fed *Spondias mombin* plus concentrate. *Nigeria Journal of Animal Production* . 23 (2) 161-163.

AOAC. (1995). Association of Official Analytical Chemists. Official Methods of Analysis, 17th Ed. Washington D.C, USA, pp 69-88

ARC. (1991). Agricultural Research Council; The nutrient requirement of ruminant livestock. Common Wealth Agricultural Bureax, Farnhan Royal, Slough U.K. pp125

Chesworth, J. (1992). Ruminant Nutrition. The Tropical Agriculturist. (CTA) (The Technical Centre for Agricultural and Rural Co-operation), P. O. Box. 380, 6700, Aj Wageningen, The Netherlands.

Duncan, D. B. (1995). Multiple Range and Multiple Test Biometrics 11:1 – 42

Hossain, M.K.(1999). Quick guide to multipurpose trees from around the world. *Gmelina arborea:* A popular plantation species in the tropics.

Mc Allan, A.B (1991). Sources of nitrogen supplements for maximum cereal crop residue digestion in the rumen. In: Production and utilization of lignocellulosic (Galle HGC. ED.), Elsevier Science Publisher LTD, England, pg 375- 385.

Moran, J., Satoto, K. B. and Dawson, J. E. (1983). The utilization of rice straw fed to Zebu cattle and swamp buffalo as influenced by alkali treatment and Leucaena supplementation. *Aust. J. Agric. Res. 34 : 73 – 84.*

NSADP. (1995). Niger State Agricultural Development Project, 31st Quarterly Report, January –March. In: Nigerian Agro – Newsletter. Vol. No. 2. July – December. Pp. 32 -33.

Eniolorunda, O. O. and Rowaiye, G. A. (2008). Effect of solubilization of corn husk supplemented with cassava leaf meal and Leucaena leaf meal. based diet, as fed to Yankasa sheep, on feed intake and growth rate. *Proceedings of the 33rd Annual conf. Of the Nigerian Society for Animal Production. Olabisi Onabanjo Univ., Ayetoro, Ogun State,*
Pp 615 – 616.

Orskov, E.R. and Ryle, M. (1990). Energy Nutrition in Ruminants. Elsevier Applied Science, London

Preston, T. R. and Leng, R.A. (1987). Matching ruminant production systems with available resources in the tropics and sub-tropics. CTA (The Technical Centre for Agricultural and rural Cooperation).Post bus 380-6700. A.J. Wageningen, The Netherlands pp245.

Shiawoya, E. L. (1999) Performance of local Yankasa rams on a year round diet of Groundnut Haulms, *Gmelina* leaves and concentrates. Ph.D. Thesis. Dept; of Animal Production, Federal University of Technology, Minna, Nigeria

Shiawoya, E. L., Fasanya, O.O.A. and Ikhatua, U.J. (2000). Apparent nutrient digestibility in Yankasa rams placed on a year round diet of groundnut haulms, Gmelina leaves and concentrates. *Journal of Agricultural Technology 8(1):5-12.*

Shiawoya, E.L., Ikhatua, U.J. and Fasanya, O.O.A. (2001). Feedlot performance of Yankasa rams fed a year round diet of groundnut haulms, Gmelina leaves and *...nal of Science, Tech. And Maths Education.* 4 (2): *134-149.*

Shiawoya, E.L. and Olatunji, E. (1994). Performance of Yankasa sheep fed graded levels of *Leucaoena leuccephala* and *Gliricidia sepium* cum yam peel. *Journal of Agricultural Technology* 2: 32-37

Steel, R. G. D. and Torrie, J. H. (1980). Principles and Procedures of Statistics. Mcgraw, Hill Book Company Inc, New York.

Taiwo, A.A., Adebowale, E.A., Akinsoyinu, A.O. and Greenhalgh, J.F.D. (1995). Comparative studies on the use of four protein supplements by West African Dwarf (WAD) sheep. *Nigerian Journal of Animal production,* 22 (1).