



VOLUNTARY FEED INTAKE, FEED UTILIZATION AND BODY WEIGHT OF RED SOKOTO GOATS FED CONCENTRATE REPLACED WITH *Parkia biglobosa*

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Abstract

To assess the effect of replacement of supplemental concentrate diet at 0 (T1), 25 (T2) and 50% (T3) with *Parkia biglobosa* (PB) forage (dry matter basis) on feed intake, utilization efficiency and weight change, fifteen Red Sokoto bucklings were used in a 70-d experiment. Goats were fed at 5% of their body weight (BW). Intakes of dry matter (DM), crude protein (CP) and nitrogen free extract were outstanding ($p < 0.05$) for concentrate replacement with 25% PB forage compared with 0 and 50% replacement. Intakes of crude fibre and ether extract and final BW were not ($p > 0.05$) affected by the diets. Mineral (ash) intake was greater ($p < 0.05$) for 25% concentrate replacement than 50% concentrate replacement with PB forage. However, mineral intake was similar for 0 and 25% and 0 and 50% concentrate replacement respectively. While final BW was similar across the treatments, BW gain was higher for T2 than for T1 and T3 which had parallel BW gain. Feed efficiency expressed as (kg BW gain/kg DM intake and kg BW gain/kg CP intake) was not influenced by the diets. Concentrate ration can be replaced by 50% of PB forage in the diet of goats without impairing the growth performance. However, for optimisation of growth performance, 25% concentrate replacement with *Parkia* forage is recommended.

Keywords: concentrate replacement, intake, goats, *Parkia biglobosa*, weight gain

Introduction

Goat production in Nigeria is a smallholder affair characterized by little or no input, and the animals depend predominantly on low quality seasonally available pastures and other lignocellulosic agricultural wastes (Olafadehan *et al.*, 2016). Therefore, the productive and reproductive performance of these goats is impaired by poor nutrition. The need for intensive goat production in order to boost the dwindling animal protein intake of the ever increasing Nigeria population is obviously a necessity now. However, intensive goat production, apart from housing and medication, will require feeding of concentrates to improve their performance and boost milk and meat production and availability for human consumption. Nevertheless, concentrates are expensive and unavoidable by the farmers (Olafadehan *et al.*, 2015). Therefore, the need for developing feeding strategies that will reduce concentrates dependence and use becomes inevitable. Tree leaves have proven a viable alternative to concentrates (Olafadehan *et al.*, 2014, 2016, 2018). African locust bean (*Parkia biglobosa*) is a tropical evergreen tree belonging to the family *Mimosoidae*. Being a leguminous tree, its leaves are rich in protein and could be a valuable source of fodder for ruminants. Presently, no study has been carried out on the replacement of concentrate diet with *Parkia* forage in goat feeding. The study investigated the effect of partial replacement of concentrate with *Parkia* forage on feed intake and utilization and body weight change of Red Sokoto goats.



Materials and Methods

Fifteen Red Sokoto bucklings of about 8 months, with an average initial body weight (BW) of 13.7 ± 0.52 kg, were used for the study. Before the experiment commenced, goats were given prophylactic treatment. The goats were weighed, divided into 3 groups of similar BW, penned individually and allowed to adapt to pens and diets for two weeks. The basal diet, threshed sorghum heads (TSH), was offered *ad libitum* while diets were fed at the animal's 5% BW for 70 d. A concentrate ration was formulated to contain: 25% maize, 27% corn bran, 30% brewer's dried grain, 12% groundnut cake, 1% urea, 2% limestone, 2% salt, 1% vitamin-mineral premix. Fresh leaves of PB, used to replace concentrate ration, were harvested at matured stage. Animals in treatment 1 (T1) received concentrate at 5% of their body BW, while 25% and 50% of the concentrate were replaced with an equal amount (DM basis) of *P. biglobosa* leaves in treatments 2 (T2) and 3 (T3) respectively. The three dietary treatments were randomly assigned to the three treatment groups in a completely randomized design experiment. Feeding was twice daily. The amounts of feed offered daily and the residue from the previous day feeding were measured to determine feed intake daily. Representative samples of diets were taken on a weekly basis, pooled together and subsampled for chemical analysis. Initial BW was taken at the commencement of the experiment and subsequently at 7 days interval in the morning just before feeding. Samples of *Parkia biglobosa* forage and experimental diets were ground to pass a 1 mm sieve in a Wiley mill and analysed for their proximate constituents according to the methods of AOAC (1995). Data were subjected to ANOVA in CRD using the SPSS BASE 17 (SPSS software products, USA). Significant means were separated using Duncan multiple range test and significance was declared at $p \leq 0.05$.

Results and Discussion

The experimental diets satisfied the requirements of growing goats (Table 1).

Table 1 Chemical composition of the experimental diets (% DM)

	Threshed sorghum top	Concentrate	<i>P. biglobosa</i> forage
Crude protein	7.21	18.6	16.75
Crude fibre	35.04	24.74	30.28
Ether extract	6.45	9.99	6.47
Ash	12.84	6.41	9.75
Nitrogen free extract	38.46	40.26	36.75

Dry matter intake was highest for T2 followed by T0 and lowest for T3 ($p < 0.05$) (Table 2). Concentrate replacement with 25% PB forage stimulated feed intake but as the replacement level was further increased, there was a decline in intake possibly due to increased dietary fibre.

Table 2 Dry matter and nutrient intakes of experimental goats

Intake (kg/week)	Diet			SEM
	T1	T2	T3	
Dry matter	4.16 ^b	4.70 ^a	4.01 ^c	0.05
Crude protein	0.62 ^b	0.80 ^a	0.649 ^b	0.000
Crude fibre	1.29	1.27	1.14	0.10
Ash	0.36	0.37	0.35	0.000
Ether extract	0.33	0.35	0.32	0.05
Nitrogen free extract	86.49	91.56	77.56	0.02



Means in the same row with deferent superscripts are significantly different ($P < 0.05$)

T1, control; T2, 25% concentrate replacement with Pakia forage (on DM basis); T3, 50% concentrate replacement with Parkia forage (on DM basis)

The fibre content of the forage was higher than that of the concentrate it replaced. Fibre forms bulk, slows down the rate of ingesta passage through the gastrointestinal tract and causes gut fill which limits intake (Olafadehan *et al.*, 2014). The result disagrees with that of Das *et al.* (2011) who observed no differences in feed intake when concentrate was partially replaced with Barhar (*Artocarpus lakocha*) leaves in the diets of Sikkim bucklings. Intakes of CF and EE were not affected ($p > 0.05$) but mineral (ash) intake was greater ($p < 0.05$) for T2 than for T3. Intakes of CP and soluble carbohydrates (NFE) and weight gain were greater ($p < 0.05$) for T2 relative to T1 and T3.

Final BW was marginal ($p > 0.05$) among the diets (Table 3). Greater weight gain of the T2 goats (Table 3) is obviously in response to the improved feed and nutrient intakes. Olafadehan *et al.* (2017) earlier posited that, most often than not, that feed intake is a critical index of animal's performance and correlate positively with performance and productivity. Though slightly lower for T3, the similar ($p > 0.05$) WG of T1 and T3 is suggestive of the impressive fodder quality of the PB forage which maximized its utilisation for growth. This conjecture appears logical considering the reduced amounts of feed consumed by the T3 goats relative to the T1 goats. The result thus indicates that PB forage can replace 50% of concentrate in goat ration without impairing goats' growth performance. Feed utilization efficiency was not affected by the diets. Similar feed efficiency among the treatments is an indication of proper diet utilisation for growth, though the feed efficiency was higher for T2. The result concurs with previous observations (Olafadehan *et al.*, 2018) where a concentrate diet was replaced with another tree fodder, *Piliostigma thonningii*.

Table 3. Body weight gain and feed efficiency of the experimental goats

Item	Diet			SEM
	T1	T2	T3	
Initial weight (kg)	13.4	14.1	13.9	1.30
Final weight (kg)	18.8	20.4	18.8	1.87
Total weight gain (kg)	5.4 ^a	6.5 ^a	4.9 ^b	0.46
Weekly weight gain (kg)	0.54 ^a	0.65 ^a	0.49 ^b	0.08
Feed efficiency (%)				
(kg BW gain/kg DM intake)	12.97	13.83	12.2	2.58
(kg BW gain/kg CP intake)	87.47	81.45	76.02	17.69

Means across rows with different superscripts are significantly different ($P < 0.05$)

T1, control; T2, 25% concentrate replacement with Pakia forage (on DM basis); T3, 50% concentrate replacement with Parkia forage (on DM basis)

Conclusion

Fifty percent of concentrate ration can be partially replaced with PB forage in the diets of goats fed low quality basal diet. However, for optimisation of goats' performance, 25% concentrate replacement with PB forage should be advocated. There is, nonetheless, the need for further studies on cost implication of such feeding strategy to ascertain its economic viability.



References

- AOAC 1995. Official Methods of Analysis, 16th edition. Association of Official Analytical Chemists, Washington DC.
- Das, A, De, D, Katole, S. 2011. Effect of partial replacement of concentrate with Barhar leaves (*Artocarpus lakocha*) on growth performance of kids fed a mixed jungle grass-based diet. *Asian-Aust. J. Anim. Sci.* 24: 45–55.
- Olafadehan, O.A., Adewumi, M.K. and Okunade, S.A. 2014. Effects of feeding tannin-containing forage in varying proportion with concentrate on the voluntary intake, haematological and biochemical indices of goats. *Trakia J. Sci.* 12(1): 73-81.
- Olafadehan, O.A., Okunade, S.A., Njidda, A.A., Adewumi M. K., Sunday, U.E. and Salihu S.O. 2015. Feed intake, digestibility, nitrogen utilization and ruminal fermentation characteristics of Red Sokoto goats fed concentrate partially replaced with *Piliostigma thonningii* foliage. *Trop. Anim. Prod. Invest.* 18(2): 39-47.
- Olafadehan, O.A., Njidda, A.A., Okunade, S.A., Adewumi, M.K., Awosanmi, K.J. Ijanmi, T. and Raymond, A. 2016. Effects of feeding *Ficus polita* foliage based complete rations with varying forage:concentrate ratio on performance and ruminal fermentation in growing goats. *Anim. Nutr. Feed Technol.* 16: 373-382.
- Olafadehan, O.A., Okunade, S.A., Njidda, A.A., Shoyombo, A.J. and Okoye, G.C. 2017. Feed intake, morphological characteristics and economics of production of Red Sokoto goats fed urea treated ensiled cowpea husk based diets. *Nig. J. Anim. Prod.* 44(5): 218-226.
- Olafadehan, O.A., Njidda, A.A., Okunade, S.A., Sarah, S.O., Balogun, D.O. and Salem, A.Z.M. 2018. Growth performance and hematochemical parameters of buck-kids fed concentrate partially replaced with *Piliostigma thonningii* foliage. *Anim. Sci. J.* 89: 340-347.