RUN -09

Growth Performance of Yankasa Rams Fed Ammoniated Ensiled Threshed Sorghum Top Supplemented with Varying Concentrate Regimes

S.A. Okunade[1], O.A. Olafadehan[2] and B.J. Adebayo[3]
[1]Department of Animal Production Technology, Federal College of Wildlife Management, New Bussa, Nigeria
[2]Department of Animal Science, University of Abuja, Abuja, Nigeria; [3]Department of Basic Sciences, Federal College of Wildlife Management, New Bussa
Corresponding author: S.A. Okunade; E-mail: saokunade2013@gmail.com; Phone: +234 703 0294 808

Abstract
The effects of feeding different levels of a concentrate supplement to growing rams fed ammoniated ensiled threshed sorghum top (AETST) as a basal diet on voluntary intake and body weight changes were evaluated. The experiment consisted of four treatments comprising varying concentrate levels (0, 300, 450 and 550 g/d) in a completely randomized design using sixteen growing Yankasa rams. Except for AETST intake, and dry matter (DM) intake (% BW) and feed/gain ratio (F/G) which were higher ($p<0.05$) for the non-supplemented control, total DM, crude protein (CP) and organic matter (OM) intakes and average daily gain (ADG) were greater ($p<0.05$) for the supplemented diets. Among the supplemented groups, intakes of DM, OM and CP were higher ($p<0.05$) and F/G lower ($p<0.05$) for 450 and 550 g/d concentrate levels compared to 350 g/d level. Concentrate intake and ADG followed this rank order: 350 g/d < 450 g/d < 550 g/d (all $p<0.05$). A dietary concentrate supplementation level of 550 g/d of basal ATST was the most suitable level for sheep under the current experimental conditions.

Keywords: Yankasa rams, crop residues, sorghum top, silage, feed intake

Introduction

The nutritive value of crop residues may be enhanced using simple processing methods such as urea treatment and ensiling. Threshed sorghum top (TST), the outer coverage of the sorghum grain after the grains have been removed through various threshing methods (Okunade *et al*., 2016), is one of the prominent crop residues in the savannah area of Nigeria which hosts majority of ruminant animals. TST is inherently high in fibre and low in minerals, protein and fermentable energy (Isah *et al.,* 2014). Previous studies on feeding of un-treated TST to goats showed negative growth (Isah *et al*., 2015). However, feeding ammoniated ensiled TST (AETST) may improve animal performance with or without supplementation. Urea treatment of crop residues increases the nutrient intake, digestibility as well as the rumen NH_3-N concentration and microbial protein synthesis (Olafadehan and Adebayo, 2016). Concentrate supplementation improves the performance of goats and sheep on low quality basal diet. It is, however, important to determine the level of concentrate supplementation that will optimize performance.

The study was under taken to study the effect of feeding different concentrate regimes on the intake and growth performance of ram-lambs fed AETST as a basal diet.

Materials and Methods

Four kilogrammes of urea were dissolved in 100 L of water, carefully sprinkled on 100 kg dry matter (DM) of TST and thoroughly mixed together. The treated TST was filled into a large drum, compacted, sealed tightly with polyethylene sheets and covered with a heavy object placed on the cover. The AETST was opened after 3 weeks and aerated overnight to eliminate volatile ammonia gas that can cause ammonia toxicity. Sixteen 9-month-old intact Yankasa ram-lambs (similar live weight (LW), 15.3 ± 0.68 kg), housed in individual rammed floor pens with bedding material, were used in a 63-d experiment excluding 14 d adjustment period. Lambs were grouped into four and randomly assigned to one of four treatments comprising 0, 350, 450 and 550 g/d of concentrate supplementation levels to a basal diet of AETST in a completely randomized design. Feeding was twice daily, and water was given *ad libitum*. Lambs were weighed at beginning of the experiment and weekly before morning feeding to determine their growth performance. Proximate constituents of diets and faeces were analysed according to the AOAC (2005). NDF was analysed according to Van Soest *et al.* (1991).

Data were subjected to a one way ANOVA using version 9.1 of SAS software (SAS, 2001). Significant difference between means was separated by Duncan's procedure.

Results and Discussion

The concentrate diet met the requirements of growing goats (Table 1). The chemical composition of ATST compared with previous studies (Olafadehan and Adebayo 2016). Basal feed (AETST) intake of the control lambs was higher (p<0.05) than that of supplemented lambs (Table 2) but overall feed intake and intake (% BW) were lower (p<0.05) for the control relative to the treatment diets. Intake (% BW) is similar to the range of 3.8 – 4.2% reported for growing lambs (MLA, 2007). Concentrate intake increased with increasing concentrate supplementation level (p<0.05) confirming that feed intake is a function of availability (Olafadehan *et al*., 2017). Reduced intake of control diet may partly be attributed to the higher fibre of the AETST which could have resulted in reduced ruminal degradability and longer transit time in the gastrointestinal tract (Olafadehan *et al*., 2014). Supplementation with protein source increased feed intake in sheep (Bonsi *et al*., 1996). Higher CP and OM intakes (p<0.05) of the treatment diets indicate that nutrient intake is a function of feed intake (Olafadehan *et al*., 2014).

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

	Ammoniated TST (AETST)	Concentrate
Dry matter	93.20	90.60
Organic matter	95.03	96.01
Crude protein	11.30	16.84
Ash	4.97	3.85
ether extract	6.39	4.04
Total carbohydrate	77.34	75.27
Neutral detergent fibre	58.02	50.65

Table 2: Voluntary intake of lambs fed varying concentrate level

Intake (g/day)	Concentrate supplementation level (g/d)				SEM
	0	350	450	550	
ATST	669.99^{a}	497.64^{b}	457.30^{c}	442.69^{c}	11.91
Concentrate	0.00^{d}	289.35^{c}	366.91^{b}	390.48^{a}	1.59
Total dry matter	669.99^{c}	785.97^{b}	824.21^{a}	833.08^{a}	11.37
Dry matter (% BW)	3.97^{b}	4.62^{a}	4.58^{a}	4.30^{a}	0.12
Organic matter	636.69^{c}	750.65^{b}	785.59^{a}	795.50^{a}	10.68
Crude protein	73.19^{c}	104.33^{b}	113.40^{a}	115.71^{a}	1.73
Neutral detergent fibre	388.68	377.37	377.78	375.50	6.81

^{abcd} Means within the same row with different superscripts differ (P<0.05)

Final BW, weight gain (WG), average daily gain (ADG) and feed/gain ratio (F/G) were improved (P<0.05) in supplemented groups compared to the control group, indicating superior nutritive of the concentrate relative to the sole AETST diet (Table 3). However, the WG of the control lambs indicates feed utilization and suggests that ammonization and ensiling can enhance the nutritive value of low quality crop residue.

Table 3: Growth performance of lambs fed varying concentrate level

Variable	Concentrate supplementation level (g/d)				SEM
	0	350	450	550	
Initial weight (kg)	15.33	15.32	15.31	15.30	0.00
Final weight (kg)	16.34^{b}	18.67^{b}	23.21^{a}	24.23^{a}	2.16
Total weight gain (kg)	1.00^{d}	3.33^{c}	7.92^{b}	9.03^{a}	0.23
Average daily gain (g/d)	13.00^{d}	43.30^{c}	102.85^{b}	116.88^{a}	3.09
Feed/gain ratio	55.83^{a}	18.21^{b}	8.01^{c}	7.11^{c}	0.53

^{abcd} *Means within the same row with different superscripts differ (p<0.05)*

This is contrary to previous studies (Hirut *et al*., 2011; Isah *et al*., 2015) with untreated barley straw and TST resulted in BW loss. The 11.3% CP of AETST met the CP requirement for moderate WG, in agreement with

Getahun (2006). Lower weight gain of the control lambs is obviously the consequence of the reduced feed intake and utilization. ADG increased ($p<0.05$) with increasing concentrate level implying that the higher the feed availability, the better.

Conclusion

Though positive weight gains and feed efficiency of the control lambs indicate feed utilization, AETST can be better utilized when supplemented with concentrate diet. However, 550 g/d concentrate supplementation level appears superior, due to higher weight gain, relative to other concentrate supplementation levels.

References

AOAC. (2005). Association of Official Analytical Chemist. Official method of analysis 18th edition, Association of Official Analytical Chemists. Washington D.C., USA.

Bonsi, M.L.K., Tuah, A.K., Osuji, P.O., Nsahlai, V.I. and Umunna, N.N. (1996). The effect of protein supplement source or supply pattern on the intake, digestibility, rumen kinetics, nitrogen utilization and growth of Ethiopian Menz sheep fed tef straw. *Anim. Feed Sci. Technol.,* 64(1):11-25.

Getahun, K. (2006). Effect of urea-treatment and leucaena (*Leucaena leucocephala*) supplementation on the utilization of wheat straw as feed for sheep. MSc. Thesis, Haramaya University, Dredawa, Ethiopia.

Hirut, Y., Solomon, M. and Mengistu, U. (2011). Effect of concentrate supplementation on live weight change and carcass characteristics of Hararghe Highland sheep fed a basal diet of urea-treated maize stover. *Livest. Res. Rural Dev.,* 23(12).

Isah, O.A., Okunade, S.A., Aderinboye, R.Y. and Oyekunle, M.A. (2014). Rumen fermentation and microbial profile of Red Sokoto goats fed threshed sorghum top supplemented with browse foliages. *Trop. Anim. Prod. Invest*., 17 (1): 67-73

Isah, O. A., Okunade, S. A**.,** Aderinboye, R. Y. and Olafadehan, O.A. (2015). Effect of browse plant foliage supplementation on the performance of buckling goats fed threshed sorghum top basal diet. *Trop. Anim. Health Prod*. 47(6): 1027-1032.

MLA (2007). Meat and Livestock Australia Limited. Assessed from: www.mla.com.au.

Okunade, S. A., Isah, O.A., Oyekunle, M.A., Olafadehan, O.A. and Makinde, O.J. (2016). Effects of supplementation of threshed sorghum top with selected browse plant foliage on haematology and serum biochemical parameters of Red Sokoto goats. *Trop. Anim. Health Prod*., 48(5): 979 – 984

Olafadehan, O.A. Okunade, S.A. and Njidda, A.A. (2014). Evaluation of bovine rumen content as a feed for lambs. *Trop. Anim. Health Prod.,* 46(4): 939-945.

Olafadehan, O.A**.** and Adebayo, O.F. (2016). Nutritional evaluation of ammoniated threshed sorghum top as a feed for growing goats. *Trop. Anim. Health Prod.,* 48(4): 785-791.

Olafadehan, O.A. Njidda, A.A., Okunade, S.A., Sarah, O.S., Balogun, O.D. and Salem, A.Z.M. (2017). Performance and hematochemical parameters of buck-kids fed concentrate partially replaced with *Piliostigma thonningii* foliage. *Anim. Sci. J*., doi:10.1111/asj.12814 (In press).

SAS. (2001). Statistical Analytical Systems, Users Guide Version 9.1, SAS Institute Inc., Cary, North Carolina, USA

Van Soest, P.J., Robertson, P.J. and Lewis, B.A. (1991). Methods for dietary fibre, neutral detergent fibre and non-starch polysaccharides in relation to animal nutrition. *J. Dairy Sci.,* 74: 3583-3597.