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Feed Intake and Nutrient Digestibility of Growing Yankasa Rams Fed Sorghum Stover Supplemented with Graded Levels of Dried Poultry Droppings Based Diet

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ABSTRACT

The use of conventional feedstuff such as groundnut cake, fish meal, etc. as supplement to low quality feed may not be cost effective in present day Nigeria to intensify production, owing to their high cost, irregular supply. It's pertinent therefore to shift attention to the use of non-conventional protein materials of farm waste origin such as poultry droppings. This study was therefore initiated to determine the feed intake and nutrient digestibihty of growing Yankasa rams fed sorghum stover supplemented with graded levels of dried poultry dropping based diets. Thirty growing Yankasa rams aged 9-12 months, weighing 11.5-15.5 kg were randomly divided into five groups (6 in each) and assigned to five supplemental diets designated T_1-T_5. Fresh poultry droppings were sun-dried for 3-5 days to minimize the level of microbes present. Thereafter the product were milled and included in ram's diet at 0, 20, 40, 60 and 80%. Animals were fed in the morning (supplementary) and evening (basal diets). Salt-lick, water were also provided. Data were collected on feed intake and nutrient digestibility coefficient. Results showed that rams fed the control diet significantly ($p<0.05$) had lower feed intake as well as apparent nutrient digestibility coefficient when compared with the rams fed dried poultry droppings based diets. It was concluded that dried poultry droppings inclusion up to 80% in the diet of the rams enhances feed intake and nutrient digestibility and thus increases live weight gain. Therefore, sun-dried poultry droppings can satisfactorily supplement sorghum Stover up to 80% inclusion level.

Key words: Apparent digestibility, dried poultry droppings, feed intake, growing yankasa rams, sorghum stover

INTRODUCTION

Sheep population in Nigeria which is estimated to be 33.9 million, make sheep the second most important livestock species in the country (FAO, 2008). In Nigeria, sheep are kept primarily for meat production. They contribute about 11% to the total meat supply in the country (Adu and Ngere, 1979). This class of animal requires adequate nutrients for growth and productivity. This therefore helps in meeting the protein requirement of the citizenry.

The use of conventional feedstuff such as maize, soybean cake, fish meal and others as supplement to low quality feed may not be cost effective in present day Nigeria to intensify production, owing to their high cost, irregular supply (Akinmutimi, 2004) and the competition both with humans and monogastric animals (Adama, 2008; Ajayi *et al.*, 2008; Ukpabi and Abdu, 2009).

It is in this respect that non-conventional energy and protein materials of farm and agro-industrial wastes origin are presently being utilized for livestock production in Nigeria (Ndubueze *et al*., 2006; Okonkwo *et al*., 2008). Such feed resources should be cheap, have high nutritive value, non-toxic, readily available, should have low or no demand by both human and other livestock species and without industrial usage (Egbo *et al*., 2001; Amaefule, 2002; Ndubueze *et al*., 2006).

There are many agricultural crop residues with great potentials for ruminant animal feeding. Sorghum Stover is one of such usable crop residues as ruminant animal feed. Sorghum Stover consists of the leaves and stalks after harvest and has been used mostly as roughage for cattle, sheep, goats and horses (Alawa and Umunna, 1993). Sorghum Stover is highly fibrous. Its usage is limited mainly to cattle, sheep and goats which can convert in excess of 60% of the crude fibre component (Alhassan *et al*., 1984). The mean voluntary consumption of supplemented sorghum Stover has been found to be about 1.1% of body weight for intensively fed goats and cattle and 1.4% for sheep (Alhassan *et al*., 1984; Alhassan, 1985).

The above researchers suggested supplementation with a minimum of 60 g of cotton seed cake (CSC head day^{-1}) for sheep and 50 g/head day^{-1} for goats to reduce weight losses. Sorghum Stover is readily available especially during the dry season, after the year's harvest, cheaper to cure and store, hence it can be fed to ruminant animals as a basal feed. Above all, it may offer reductions in feed costs and therefore has a great impact on the total cost of livestock production.

Poultry litter is an agricultural waste from poultry farms in the rural, sub-urban and industrial settlements which often constitute health hazard due to inadequate means of disposal, especially when not utilized as fertilizer. The proximate analysis of poultry litter, particularly nitrogen which is high in content (Jordaan, 2004; Lanyasunya *et al*., 2006) indicate that offering it to ruminant animals would be a first-rate avenue to turn nutrients in the waste into animal products for human's use; therefore it can be a good feed for ruminant animals.

Also, Poultry litter is rich in macro and micro-minerals such as Ca, P, Na, Cl, Co, I and Cu. They are readily available and comparatively cheaper than conventional feedstuff such as groundnut cake, soybean cake or cottonseed cake which is customarily used in ruminant ration as a major protein supplement. In the same vein, about 30% poultry litter is true protein, the remainder being uric acid which is slowly degraded in the rumen; it is thus an ideal protein source for ruminant animals. Its use as protein supplement has been investigated in Nigeria (Ibeawuchi *et al*., 1993; Belewu and Adeneye, 1996; Maigandi and Owanikin, 2002; Ndubueze *et al*., 2006; Aro and Tewe, 2007; Fajemisin *et al*., 2008; Abdul *et al*., 2008). Majority of these researchers concluded that the usage of poultry litter might be a good alternative to minimize feed cost in livestock production enterprise, at least in the developing countries like Nigeria.

They reiterated that it can be fed as a sole protein supplement resulting in increase in weight gain, therefore it can sustain ruminants maintenance and even production needs when fed with the appropriate energy source (Aduku, 2004; Abdul *et al*., 2008), while in the same vein, it is an avenue of disposing of a waste in environmentally healthy manner (Ahmed and Talib, 2008). However, its optimum level of use in combination with crop wastes such as Sorghum Stover has not been properly established especially in the guinea savannah zone of Nigeria, where a lot of grains are produced annually. This study was therefore initiated to determine the feed intake, as well as nutrient digestibility of Yankasa rams fed sorghum Stover, supplemented with graded levels of dried poultry droppings based diet.

MATERIALS AND METHODS

The experiment was carried out at the Department of Animal Production, Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology, Main Campus, Gidan-Kwano Minna. Minna is located within latitudes 09°31[1] and 09° 42[1] North and longitudes 06° 29[1] and 06° 41[1] East with an altitude of 260 meters (853 ft) above sea level. It is bounded by River Niger running the North -West Flank down to the South Western part of the state. It falls within the Southern Guinea Savannah agro-ecological zone of the country NSADP (1995) as was cited by Lanko (2005). The town experiences mean monthly temperature of 30.5°C with the highest in the month of March and the lowest in August, 22-30°C. The raining season lasts for a period of five months on the average with annualaverage rainfall of 1400 mm in the month of July and August. Relative humidity ranged between 60 and 75% (Danwake, 1999). The experiment was conducted between the months of February-May 2011.

Experimental animals and their management: Thirty Yankasa rams aged 9-12 months and weighing 11.5-15.5 kg was used for the experiment. The rams were sourced from Mariga and Beji local markets in Niger State. The animals were housed in individual pens with corrugated iron roof and a concrete floor. Wood shavings were used as bedding materials to protect the animals from dampness and/or cold and were changed on weekly basis. The animals were treated against ectoparasites, using ivermectin injection, were dewormed with Albendazole Bolus to take care of endoparasites and also injected intra-muscularly with Oxytetracyline-long acting broad spectrum antibiotic as a precautionary measure against bacterial infections. The animals were later allotted into five treatment groups and fed for a pre-treatment period of two weeks to enable them adapt to the experimental diets and the environment before the commencement of the actual experiment. Salt-licks were provided throughout the period of the experiment. And water was provided *ad-libitum*. Feed offered and feed refused were recorded for each animal in each group daily while animal weights were taken on a weekly basis, using a spring balance. Average daily feed intake and average daily weight gain were calculated over the 106 day experimental period. The animals were under feedlot management.

Experimental design: The experimental design used was Complete Randomized Design. (CRD) The rams were randomly assigned to five treatments (T_1-T_5) comprising of three replicates with two animals per replicate. Treatment one (T_1) were rams fed 0% Dried Poultry Droppings (DPD), T_2 were fed with 20% DPD, T_3 were fed with 40% DPD, T_4 were fed with 60% DPD and T_5 were fed with 80% DPD. Feeding trial lasted for 106 days.

Source of feed ingredients and feed preparation: Sorghum Stover was sourced in Bosso and Chanchaga areas of the town after the grain harvest and chopped using cutlass to 2-3 cm long before feeding as basal feed. Fresh poultry droppings were obtained from caged layers reared commercially at Abu-Turab poultry farm in Minna. The poultry droppings were sun-dried for 5-6 hours daily for 3-5 days to minimize the level of microbes present. The product was thereafter pounded using pestle and mortal and used as feed. They were sourced between October to December 2009.

Diet formulation: Two experimental diets were prepared for the study: basal and supplementary diets. A total of 2000 g of chopped Sorghum Stover were fed as basal diet/ram/day. Five types of supplementary diets were prepared and fed. The supplements consist of the following; Maize

Bran (MB) alone (100%), Maize Bran (MB)+dried Poultry Droppings (MB+DPD) (80:20), Maize Bran (MB)+dried poultry manure (MB+DPD) (60:40), maize bran (MB+DPD) (40:60), Maize Bran (MB)+dried poultry manure (MB+DPD) (20:80). The basal and supplementary diets were offered at the rate of 3 and 2% of body weight, respectively.

Digestibility trial: Three animals were randomly selected from each treatment at the termination of the growth study. They were placed in an individual metabolic cage with slatted floors adapted for faecal collection. Experimental diets fed were the same as those used in the growth study. An adjustment period of 5 days was allowed before the faecal samples were measured for the subsequent seven days. Faeces from animals on each treatment were bulked thoroughly mixed and sub- sampled taken. Feed intake was measured by finding the difference between the amount of feed offered and the amount refused. Feed and faecal samples were dried at 65°C to constant weight, milled and kept in air tight containers until required for analysis. Apparent digestibility of the diets was calculated as the difference between nutrient intake and excretion in the faeces expressed as a percentage of the nutrient intake (Maynard *et al.*, 1979; Marshal, 2001; Aduku, 2004).

Chemical analysis: The experimental diets were analyzed for dry matter, crude protein, crude fibre and ash according to AOAC (1990). Samples of feed offered, faecal output were analyzed for dry matter, crude protein, crude fibre, ether extract and ash according to AOAC (1990).

Statistical analysis: All data generated were subjected to analysis of variance (ANOVA) using the General Linear Model (GLM) procedure of SAS (2008).Means were separated Using Least Significant Difference (LSD) test of the same package.

RESULTS AND DISCUSSION

Table 1 shows the proximate compositions of the experimental feeds. The dry matter content of the experimental feed ranges from 84.20% in maize bran to 94.09% in sorghum Stover. The poultry droppings used in this study has a crude protein value of 21.88%, lower than 26.60% reported by Ndubueze *et al.* (2006); 28.20% reported by Abdul *et al.* (2008), but higher than 15.40, 20.3% reported by Lanyasunya *et al.* (2006), Onimisi and Omage (2006) and Owen *et al.* (2008) respectively. The variations in the crude protein values of the poultry manure may be attributed to type of bird, the age of the manure and level of feeding the birds.

The lower value of Crude Protein (CP) of the sorghum Stover (3.5%) reported in this study justifies the need for supplementation. This agrees with the results reported by Alhassan (1988)

Table 1: Proximate composition of experimental feeds

Parameters	Sorghum stover	Maize bran	Dried poultry droppings
Dry matter (%)	94.09	84.20	93.00
Crude protein (%)	3.50	7.00	21.88
Crude fibre (%)	31.20	3.20	20.67
Ash (%)	3.90	5.50	33.00
Ether extract (%)	1.11	5.00	3.30
Nitrogen free extract	54.39	63.50	14.15
Gross energy (kcal g^{-1})	2.02	3.90	2.65

and Abdul *et al.* (2008). The high level of crude fibre reported for both the poultry dropping (20.67%) and sorghum Stover (31.20%) are expected because of the litter material and the lignifications of the sorghum Stover. The ash content (33.00%) reported for poultry dropping in this study is lower than 41.60% reported by Zinn *et al.* (1996). The gross energy values of sorghum Stover (2.02 kcal g^{-1}) is low, this is in line with the findings of Ayoola and Ayoade (1992). This lower value in sorghum Stover energy level justifies the need for inclusion of additional energy source Aduku (2004) and Abdul *et al.* (2008).

The dry matter content of the supplementary diet (Table 2) ranges from 84.20% in the control diet (T_1) to 92.80% in T_5. The crude protein contents of the supplementary diet were between 7.00% in T_1 to 15.40% in T_5. The values reported in this study were within and slightly above the range (9-14%) reported by Aduku (2004) except T_1 which falls below the range. The gross energy contents of the supplementary diet followed the same trend as crude protein with exception of T_1 all others falls within the values recommended by Ogundipe (2002).

Table 3 shows the results of voluntary feed intake. The mean feed intake obtained from this study indicates that animals in T_1 had lower feed intake (808.80 g day^{-1}). This is in line with the findings of Reid and Klopfenstein (1983) which showed feeds with low CP contents are seldom consumed by animals. Animals fed sorghum Stover supplemented with dried poultry droppings had higher feed intake (1028.09 to 1661.12 g day^{-1}) compared to the control group (808.80 g day^{-1}). This result is in agreement with the findings of Mubi *et al.* (2008) in their trial with growing heifer fed sorghum Stover supplemented with poultry litter where they observed, there was significant increase in feed intake of the groups supplemented, a conclusion also reached by Abdul *et al.* (2008).

The result of apparent digestibility coefficient is shown in Table 4. There were higher ($p<0.05$) significant differences between the supplemented treatment groups (T_2-T_5) and unsupplemented treatment group (T_1). The result showed that the former groups had higher DM, CP, CF, Ash and EE digestibility values compared to the later group that had lower values. Dry matter digestibility was significantly ($p<0.05$) higher in T_5 (91.4) compared to T_1 (81.0). The same trend was observed with crude protein, for T_5 (86.6) as against T_1 (76.8), crude fibre for T_5 (88.3) compared to T_1 (70.8), ash for T_5 (87.8) vs T_1 (67.0) and ether extract for T_5 (92.1) compared to T_1 (58.3). This present result is in agreement with the findings of Abdul *et al.* (2008); Solomon *et al.* (2008) and

Table 2: Proximate composition (% DM Basis) of supplementary diets fed to the experimental animals

Composition	T_1	T_2	T_3	T_4	T_5
Dry matter	84.20	88.60	92.20	85.80	92.80
Crude protein	7.00	13.13	13.60	14.00	15.40
Crude fibre	3.20	6.70	9.30	12.50	8.00
Ash	5.50	12.00	12.50	16.50	25.00
Ether extract	5.00	20.00	12.50	12.50	17.50
Nitrogen free extract	63.50	36.77	44.30	30.30	26.90
Gross energy (kcal g^{-1})	2.27	2.53	2.81	3.90	4.23

Table 3: Feed intake of the experimental animals

Items (g)	T_1	T_2	T_3	T_4	T_5
Concentrate diet	225.47	328.09	344.76	420.00	494.52
Basal diet	583.33	700.00	933.33	1050.00	1166.66
Total	808.08	1028.09	1278.09	1470.00	1661.12

Table 4: Apparent digestibility coefficient of the experimental animals

Parameters (%)	T_1	T_2	T_3	T_4	T_5	LS
Dry matter	81.0^e	86.7^d	88.1^c	89.3^b	91.4^a	*
Crude protein	76.8^e	81.0^d	82.0^b	83.4^b	86.6^a	*
Crude fibre	70.8^e	82.5^d	84.7^c	86.8^b	88.3^a	*
Ash	67.0^e	80.4^d	82.6^c	85.6^b	87.8^a	*
Ether extract	58.2^e	87.2^d	89.4^c	91.9^b	92.1^a	*
Nitrogen free extract	95.3^b	94.4^d	94.7^c	96.4^a	94.7^c	*

Mean values with the same letter(s) along the row are not significantly different ($p<0.05$), LS: Level of significance, *Significant difference ($p<0.05$)

Dessie *et al*. (2010). The higher digestibility coefficient values observed in the supplemented treatment groups could be attributed to the higher CP intake compared to the unsupplemented treatment group. On the other hand, the lower digestibility coefficient values recorded for the control treatment group could be attributed to the lower CP content of their diets.

CONCLUSION AND RECOMMENDATION

From the results obtained from this study. It can be concluded that animals supplemented with dried poultry droppings based diet had the best feed intake and apparent digestibility coefficient thus better feed utilization hence increase in live weight gain. Therefore, it is recommended that dried poultry droppings based diet can satisfactorily supplement sorghum Stover up to 80% inclusion level when fed to growing Yankasa rams.

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