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Effects of Supplementing Sorghum (Sorghum bicolor L moench) Stover with Dried Poultry Dropping Based Diet on Performance of Growing Yankasa Rams

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Abstract: *This experiment was carried out to evaluate the effects of dried Poultry dropping based diets on feed intake, live weight changes and nutrient digestibility of Yankasa rams. Thirty growing Yankasa rams aged between 9 – 12 months weighing 11.5 – 15.5 kg were used in a completely randomized design experiment. The experimental animals were randomly allotted to 5 treatments (T_1-T_5). T_1 were rams fed with 0 % dried poultry droppings (DPD), T_2 were 20 % dried poultry droppings (DPM), T3 were 40 % dried poultry droppings (DPD), T4 were 60% dried poultry droppings (DPM), T5 were 80% dried poultry droppings (DPM). Mean feed intake increased significantly (P<0.05) as the level of inclusion increases T_1 (2.9 kg), T_2 (14.8 kg), T_3 (18.2 kg) T_4 (18.3 kg) and T_5 (24.0 kg). The final live weight gain was significantly (P<0.05) higher in T_5 (17.8) than T_1 (12.8) T_2 (15.3) T_3 (15.6) and T_4 (16.9). Similarly in the mean average weekly gain T_2 and T_5 performed significantly (P<0.05) better compare to other treatments. Nutrient digestibility was generally significantly higher (P<0.05) in T_5 in all the parameters measured except in Nitrogen free extract. The results of this study suggests that inclusion of dried poultry dropping up to 80% in a sorghum Stover basal diet would give satisfactory performance in growing Yankasa rams.*
Keywords: *Dried Poultry Droppings: Sorghum Stover: Yankasa Rams*

I. Introduction

The basic reason for the poor performance of livestock in developing countries is the seasonal inadequacy of feed, both in quantity and quality [24]. Hence, appropriate uses of relatively inexpensive agricultural and agro-industrial by-products are important to profitable livestock production [28]. During the dry season, ruminant livestock depends on crop residues in most part of Nigeria, particularly the Savannah middle belt which produces large amounts of rice straw, maize, millet, sorghum Stovers etc as some of the main residues from cropping activities [12]. However, crop residues are characterized by high fibre content and low protein,, energy, mineral and vitamin content. As a result, the intake and digestibility of these feed resources are low.

The use of convectional feedstuff such as maize, soybean cake, fish meal, etc as supplement to low quality feed may not be economically feasible in present day Nigeria to enhance production, owing to their exorbitant cost, erratic supply [7] and the competition both with humans and monogastric animals [3, 6,1]. It is in this light that non-convectional energy and protein materials of farm and agro-industrial wastes origin are presently being exploited for livestock production in Nigeria [27, 30]. 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 [17, 9, 27].

Poultry dropping is one of such usable farm wastes. Poultry dropping is an agricultural waste from poultry farms which often constitutes health hazard due to inadequate means of disposal, especially when not utilized as fertilizer. The chemical composition of poultry dropping, especially the high nitrogen content [19, 23]. suggests that feeding it to ruminants would be an excellent way to convert nutrients in the waste into animal products (wealth) for human consumption; hence it can be a valuable feed for ruminants. Also, poultry dropping is rich in macro and micro-minerals such as Ca, P, Na, Cl, Co, I, and Cu. Additionally, they are readily available and comparatively cheaper than the convectional feedstuff such as groundnut cake, soybean cake or cottonseed cake which are customarily used in ruminant ration as a major protein supplement. Its use as protein supplement investigated in Nigeria [20, 13, 25, 27, 11, 18, 26,]. Most of these authors concluded that the utilization of the product might be a viable option for reduction of feed cost in livestock production, at least in the developing countries. They reiterated that it can be fed as sole protein supplement resulting in increase in weight gain; hence it can support ruminant maintenance and even production needs when fed with appropriate energy source [5, 1]. While in the same vein, it is a means of disposing of a waste in environmentally sound manner [37].

However, it optimum level of use in combination with crop residues such as sorghum Stover has not be properly established especially in the guinea savannah zone of Nigeria, where a lot of grains are produced annually. Therefore, the objective of this work was to assess the effects of feeding dried poultry dropping based diets as supplement on feed intake, live weight changes, nutrient digestibility in Yankasa rams fed a basal diet of sorghum Stover

II. Materials and Methods

The experiment was carried out at the Teaching and Research Farm of the School of Agriculture and Agricultural Technology of the Federal University of Technology, Main Campus, Gidan-Kwano along Minna-Bida Road. Niger State is located within latitudes 09^o 31^I and 09^o 42^I North and longitudes 06^o 29^I and 06^o 41^I East with an altitude of 260 meters (853ft) above sea level. It falls within the Southern Guinea Savannah agro-ecological zone of the country [29, 22]. The town experiences mean monthly temperature of 30.5^{oC} with the height in the month of March and the lowest in August, 22-30^{o}C. The raining season lasts for a period of five months on the average with annual average rainfall of 1400mm in the month of July and August. Relative humidity ranged between 60% and 75% [13].

Thirty (30) Yankasa rams weighing between 11.5 – 15.5kg and with an average age of 9-12 months, were used for the study. The animals were housed in individual pen 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 quarantined for two weeks during which they were neck-tagged (for identification), treated against ectoparasites, using Ivermectin injection, dewormed with Albendazole bolus and injected intramuscularly with Oxytetracycline-long acting broad spectrum antibiotic. The animals were fed for a pre-treatment period of two weeks to enable them adapt to the experimental diets and the environment before the commencement of data collection. Salt-lick and clean water were provided ad.libitum throughout the period of the experiment. The feed were offered twice daily at 800 hours and 1700 hours. Feed refusals were weighed the following morning before offering fresh feed to determine voluntary feed intake and average daily weight gain were calculated over the 106 days experimental period. Feed conversion ratio was also calculated for each treatment from feed intake and weight gain.. The animals were provided with both water and salt licks ad libitum

The experimental design used was the completely randomized design. Thirty (30) Yankasa rams were randomly assigned to five treatments designated T_1-T_5 comprising of three replicates with 6 animals per treatment and 2 animals replicate. T_1 were rams fed with 0% dried poultry droppings (DPD), T_2 were 20% dried poultry droppings, T3 were 40% dried poultry droppings, T4 were 60% dried poultry droppings, T5 were 80% dried poultry droppings.

Sorghum Stover was sourced in Bosso and Chanchaga areas of the town immediately after the grain harvest and chopped using cutlass to 2-3cm long before feeding as basal feed. Fresh poultry droppings was obtained from caged layer reared commercially at Abu-Turab poultry farm in Minna. The poultry droppings was sun-dried for 3-5 days to minimize the level of microbes present. The product was thereafter pounded using pestle and mortal and used as feed.

Two experimental diets were prepared for the study, basal and supplementary diets. 600 grammes of chopped sorghum Stover were fed as basal diets across the treatment groups. The composition diets and supplementary diets were also prepared and fed as shown in table 1and 2. The basal and supplementary diets were offered at the rate of 3% and 2% of the body weight respectively.

The experimental feed samples were oven dried at 105^0 C to constant weight and the dried samples were then ground in a laboratory hammer mill to pass through a 1mm sieve and then analyzed for dry matter (DM), crude protein (CP), crude fibre (CF), Ash, Nitrogen free extract (NFE), Ether extract (EE) determination [2].

All data generated from the study were subjected to analysis of variance (ANOVA) using the general linear model (GLM) procedure of SAS (2008). Means were separated using Duncan Multiple Range test [16] least significant difference (LSD) test of the same package.

III. Results

The results of the proximate analysis and energy determination of experimental feeds are presented in Table 1. The crude protein in dried poultry dropping (21.88%) is observed to be higher than those in maize bran (7.00%) and sorghum Stover (3.5%). Crude fibre value in sorghum Stover (31.2%) is higher than the values obtained in dried poultry dropping (20.67%) and maize bran (3.20%). Ash value of dried poultry dropping (33.00%) is by far higher than in sorghum stover (3.9%) and maize bran (5.5%). Ether extract values (5.00%) of maize bran is higher than the value obtained in dried poultry dropping (3.3%) and sorghum Stover (1.1%). Nitrogen free extract value of maize bran (63.50%) is higher than those of sorghum Stover (54.39%) and dried poultry dropping (14.15%). The calculated gross energy of maize bran (3900kcal/g) was higher than the energy value of calculated for sorghum Stover (2020kcal/g) and for dried poultry dropping (2650kcal/g).

The results of the proximate analysis and energy determination of supplemental diet are shown in Table 2. The dry matter levels of the supplementary diets ranges between 84.20% in treatment 1 to 92.80% in treatment 5. The crude protein in the supplementary diet ranges from 7.00% in treatment 1 to 15.40% in treatment 5. The crude fibre levels ranged from 3.2% in T_4 25.00% in T_5. The Ether extract was highest in T_5 (17.50%) and lowest in T_1 (5). Nitrogen free extract values vary between 30.30% in treatment 4 to 63.50% in treatment 1. The calculated gross energy ranges from 2.27kcal/g in treatment 1 to 4.23kcal/g in treatment 5.

The mean feed intake values were observed to increase as the level of supplementation increases.T_5 was observed with significantly ($p<0.05$) highest values. There were significant differences ($P<0.05$) across the treatment group in average weekly body weight gain, however, T_2 and T_5 were observed to have significantly higher values in average weekly body weight gain than the other treatment groups T_3 has significantly ($p<0.05$) highest values in Feed Conversion Ratio (FCR) compared to other treatment groups. (Table 4).

The dry matter digestibility was significantly ($P<0.05$) highest in T_5 and lowest in T_1. Similar trend was observed in crude fibre, ash and digestibility. Crude protein digestibility was similarly highest in T_5 this was closely followed by T_4. However, the result of the ether extract showed that T_5 differ significantly ($P<0.05$) from other treatment groups. T_1 was observed with significantly ($P>0.05$) lowest values in 5 of the 6 parameters (Table 5.).

IV. Table 1.

Proximate Composition and energy values of the Sorghum stover, Maize bran and dried poultry dropping fed to Yankasa rams

Parameters	Sorghum Stover	Maize bran	Dried poultry dropping
DM %	94.10	84.20	93.00
CP %	3.50	7.00	21.88
CF %	31.20	3.20	20.67
Ash %	3.90	5.50	33.00
EE %	1.11	5.00	3.30
NFE %	54.39	63.50	14.15
Gross Energy (kcal/g)	2.02	3.90	2.65

Table 2.

Proximate Composition and energy values of (% DM Basis) Supplemental Diets fed to Yankasa rams

Composition	T_1	T_2	T_3	T_4	T_5
DM	84.20	88.60	92.20	85.80	92.80
CP	7.00	13.13	13.60	14.00	15.40
CF	3.20	6.70	9.30	12.50	8.00
Ash	5.50	12.00	12.50	16.50	25.00
EE	5.00	20.00	12.50	12.50	17.50
NFE	63.50	36.77	44.30	30.30	26.90
Energy (kcal/g)	2.27	2.53	2.81	3.90	4.23

Table 3.

Composition of the Supplemental diets fed to Yankasa rams

Ingredients	T_1	T_2	T_3	T_4	T_5
Sorghum	600	600	600	600	600
Maize Bran	100	80	60	40	20
Dried Poultry Droppings	0	20	40	60	80

T_1 0 % dried poultry droppings 100 % Maize Bran
T_2 20 % dried poultry droppings 80 % Maize Bran
T_3 40 % dried poultry droppings 60 % Maize Bran
T_4 60 % dried poultry droppings 40 % Maize Bran
T_5 80 % dried poultry droppings 20 % Maize Bran

Table 4.
Mean feed intake, live weight change, feed conversion ratio of growing Yankasa rams fed sorghum Stover supplemented with dried poultry dropping

	Treatments						
Parameters	T_1	T_2	T_3	T_4	T_5	LSD	LS
Mean weekly Feed intake (Kg)	12.9^{c}	14.8^{bc}	18.2^{b}	18.3^{b}	24.0^{a}	3.9	*
Live weight (kg)							
Initial live weight	11.5	12.4	14.2	14.6	15.3	0.0	NS
Final live weight	12.8^{c}	15.3^{b}	15.6^{b}	16.9^{b}	17.8^{a}	2.1	*
Mean weekly weight gain (Kg)	1.3^{d}	2.9^{a}	1.5^{dc}	2.1^{bc}	2.5^{ba}	2.7	*
Feed conversion ratio	9.9^{b}	5.1^{e}	12.1^{a}	8.7^{d}	9.6^{c}	0.0	*

abcd: Means with the same letters along the row are not significantly different at P<0.05
LS: Level of significance
*: significant difference (P<0.05)
NS: Not significant (P>0.05)
LSD: Least significant difference
T_1 0 % dried poultry droppings 100 % Maize Bran
T_2 20 % dried poultry droppings 80 % Maize Bran
T_3 40 % dried poultry droppings 60 % Maize Bran
T_4 60 % dried poultry droppings 40 % Maize Bran
T_5 80 % dried poultry droppings 20 % Maize Bran

Table 5.
Nutrient digestibility of growing Yankasa rams fed sorghum stover supplemented with graded levels of dried poultry droppings

	Treatments					
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}	*

abcde: 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)
NS = not significant (P>0.05)
T_1 0 % dried poultry droppings 100 % Maize Bran
T_2 20 % dried poultry droppings 80 % Maize Bran
T_3 40 % dried poultry droppings 60 % Maize Bran
T_4 60 % dried poultry droppings 40 % Maize Bran
T_5 80 % dried poultry droppings 20 % Maize Bran

V. Discussion

The crude protein (21.88%) of dried poultry dropping in this study is higher than 6.60% reported by [27] and lower than 28.2% reported by Abdul et al., (2008), higher than 15.4%; 20.3% and 20% reported by [23, 31, 32] spectively. It is also within the ranges of 19.4 - 23% and 10 - 33% reported by [34, 10, 4] respectively. The variations in the crude protein values of the poultry dropping may be attributed to the type of birds, the age of the manure and the level of feeding the birds. The lowest crude protein (CP) values recorded by sorghum Stover (3.5%) is in line with those reported by [8, 1]. This lower value in sorghum Stover CP also justifies the need for supplementation. The high level of crude fibre reported for both the poultry dropping and sorghum stover, is to be expected because of the presence of wasted feed, feathers and egg shell and the lignifications of the sorghum stover as it mature at harvest. The ash content values (33%) of poultry dropping in this study is observed to be lower than 41.6% reported by [39]. The gross energy values of the sorghum stover in this work is in line with the findings of Ayoola and Ayoade, (1992). The low gross energy value of sorghum stover justifies the need for the inclusion of additional energy source according to [5, 1].

The CP values of supplementary diets obtained in this study except for the control group were all higher than the range (9-14%) reported by [5]. The calculated energy value reported in this study is in line with the values reported by [5].

The significantly lower feed intake observed by the control group agrees with the findings of [33] who observed that feeds with low CP content are seldom consumed by animals. The higher feed intake recorded by the animals supplemented with dried poultry droppings is in agreement with the findings of [26] who observed significant increase in feed intake in their trial with growing heifers fed sorghum stover supplemented with poultry litter. The final body weight results showed that as the level of DPD inclusion significantly increases the body weight also increases. This result is in consonant with the earlier report by [1] that animals fed poultry litter supplements gain weight while those not supplemented lost weight at the end of their trial. The best feed conversion ratio values obtained by animals supplemented with 20 % dried poultry droppings agreed with the findings of [15] that the lower the level of fibres in the diets, the better the feed conversion ratio.

The high and significant values observed in nutrient digestibility of all the parameters measured in this study were in line with the findings of [1, 36,21]. This could also be attributed to the higher CP intake particularly to those that were supplemented with DPD.

VI. Conclusion

This study revealed that rams fed diets supplemented with dried poultry dropping had significantly better feed intake, body weight gain and feed conversion ratio. The study also reveals that nutrient digestibility was significantly improved with DPD supplementation. Based on the results of this study, it is recommended that dried poultry dropping can satisfactorily supplement sorghum Stover up to 80% inclusion level for good performance and without any deleterious effects in growing Yankasa rams.

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