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MANURE PRODUCTION BY YANKASA SHEEP GRAZING NATURAL PASTURES IN NORTHERN GUINEA SAVANNAH ZONE OF NIGERIA

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ABSTRACT

A study was carried out to determine the quantity and quality of faeces voided by Yankasa sheep grazing native pasture and fed with concentrate and hay supplement. The study lasted for eight weeks. Results showed no significant difference (P>0.05) in faecal output between the ewes and the rams. Faeces produced per head per day averaged 0.33kg and 0.32kg for ewes and rams respectively. Nutrient concentration in the dry feaces was: N, 2.18%, P, 0.48% and K, 0.52% for the ewes and N, 2.13%, P, 0.46%, K, 0.50% for the rams. It was concluded from this study that that a large amount of manure is produced by Yankasa Sheep which has a significant nutrient value for crops. When utilized, it will enhance crop livestock integration and reduce cost of inorganic fertilizer.

Key words: Manure production, Yankassa Sheep, Fertilizer.

INTRODUCTION

The Yankasa sheep is the most numerous breed of sheep in Nigeria and also has the widest distribution, being found throughout the sub humid and semi-arid zones (FDLPCS, 1991). It is estimated to constitute about 60% of the national sheep population of 39 million (FAOSTAT, 2013).

The use of fertilizer to improve soil fertility is a routine practice by farmers. In the past a large number of farmers in Nigeria relied on animal manure as sources of fertilizer. This practice was gradually substituted within the early 70's to mid 80's by inorganic fertilizer which had been highly subsidized by Government. However, from late 90's till date we have witnessed withdrawal of subsidies. This coupled with hike in price and erratic availability has rekindled the farmer's interest in animal manure.

The use of animal feaces reduces cost of production, ameliorate the soil, improves it physical properties (Osuhor *et al*,2002), remains viable beyond one cropping season and it ensures sustainable soil improvement better than inorganic fertilizer (Odunze and Ogunwole, 2002). In addition to macronutrient (N, P, K, Ca and S) produced by organic fertilizer and also supplied by inorganic fertilizer (Yaro *et al*., 1997, Osuhor *et al*., 2002), organic fertilizer will also provide micronutrient such as Fe, Mn, Zn and Cu (Lupwayi *et al*., 2000). This study was carried out to determine the quantity and nutrient contents of feaces voided by Yankasa sheep.

MATERIALS AND METHODS

The experiment was conducted at the Department of Animal Science farm, Faculty of Agriculture, Ahmadu Bello University, Samaru Zaria. Samaru is located in the Northern Guinea Savannah on latitude $11^0$11"N of the equator and longitude 7^0 38"E with altitude of 686mm above maximum sea level (IAR, Meteorological report, 2009).

Ten Yankasa sheep consisting of 3 rams and 7 ewes were used for the experiment. The sheep were placed in individual pens which carried label corresponding to the tag on the sheep's ear for identification.

Pen were thoroughly washed and disinfected before the sheep were allocated into them. Plastic feeders and drinkers were also cleaned before the commencement of the experiment. Floor of the pen is made of concrete to ease manure collection.

EXPERIMENTAL DIET AND PROCEDURES

The animals were grazed on native pasture at an open field near the Departmental farm and supplemented with concentrate mixture consisting of Maize offal 47%, Rice offal 15%, Palm kernel cake 20%, Groundnut cake 10%, Limestone 1% and common Salt 1%. The concentrate mixture was offered at 2% body weight after the animals returned from grazing. The quantity fed was adjusted weekly in response to weight changes. The sheep were grazed together for three hours, 8.00a.m - 11.00a.m daily after grazing the animals were confined separately in their individual pen and fed concentrate mixture.

Each morning after the sheep were released for grazing, the pen was cleaned individually and the manure voided within the period of confinement collected, and weighed using a calibrated (1kg-10kg) scale.

Feacal collection lasted eight (8) weeks from mid March to mid May 2009. Samples of manure excreted by the rams and ewes were bulked together into two separate groups and about 10% of the manure from the two sexes was bulked for laboratory analysis. Feacal samples were analysed for dry matter (DM) and Nitrogen (N) according to AOAC 1990. Phosphorus (P) and potassium (K) concentrations in the feaces were determined using an atomic absorption (flame) spectrophotometer.

The species of pasture grazed upon by the sheep were determined by visual observation of the sheep while grazing. The pasture species were then collected and taken to the laboratory for proximate analysis (AOAC 1990).

Concentrate offered to the sheep was formulated to provide 15% crude protein. Hay (*Digitaria smutsii*) was provided *ad libitum*. A sample of this was analyzed for its proximate components (AOAC 1990).

The rate of daily water intake was measured using a measuring cylinder. Evaporation was noted by putting 2000ml water into a plastic drinker and the leftover water from the previous day is deducted from original volume. Hence the average water intake was deduced. Meteorological data was obtained from the Institute for Agricultural Research, Ahmadu Bello University Zaria. The data collected were analyzed using statistical package for social science (SPSS, 2006).

RESULTS AND DISCUSSION

Proximate Composition of the Experimental Diet

The proximate composition of the concentrate supplement is presented in table 1. Table 1 shows the proximate composition of the concentrate supplement and hay offered. The result showed

the concentrate to contain dry matter, crude protein, crude fibre, oil, Ash and Nitrogen free extract of 91.66%, 17.06%, 10.30%, 4.79%, 7.39%, 60.55% respectively.

The hay contained 96.38% DM, 3.32% CP, 30.63% CF, 7.89% Ash and 57.74% NFE. These are similar to the findings of Gohl, 1981 who reported 81.80% DM, 3.20% CP, 33.50% CF, 5.90% Ash and 56.10% NFE for *Digiteria decumbens* hay. Omeiza (2006) reported 88.75% DM, 9.76% CP, 32.55% CF, 1.87% EE, 11.41% Ash, 46.00% ADF and 44.41% NDF for *Digitaria smutsii* hay.

Table 2 shows the pasture species consumed by the sheep while grazing. This was composed mainly of *Andropogon gayanus, Cynodon dactylon, Pennisetum pedicellatum, Tridax procumbens* among others. The proximate analysis of these pasture species is also presented in Table 2. Generally, the results for the proximate analysis showed that dry matter ranges from 85.46 - 95.68%. This is an indication that samples analyzed constitute important, useful and dependable sources of DM for feeding livestock.

Table 2: Proximate composition (%) of pasture species consumed by Yankasa sheep during grazing

S/NO	Pasture spp	DM	CP	CF	OIL	ASH	NFE
1	*Acacia albid*a	88.95	12.31	37.76	0.06	4.12	45.75
2	*Andropogon gayanus*	85.80	5.81	26.92	0.53	14.37	52.37
3	*Crotalaria retusa*	89.58	10.00	32.73	0.37	6.45	50.45
4	*Cynodon dactylon*	86.46	6.13	25.71	0.02	8.09	60.08
5	*Desmodium scorpinus*	87.70	18.69	22.64	0.38	14.56	43.73
6	*Dichrostachus cineria*	86.59	13.75	29.09	0.64	5.81	50.71
7	*Ipomea berbata*	88.00	8.81	26.21	1.28	7.78	55.92
8	*Panicum maximum*	89.32	11.44	26.42	0.32	12.50	49.32
9	*Penisetum pedicellatum*	95.68	4.06	37.84	0.44	4.88	40.91
10	*Sorghum bicolor(leaf)*	91.61	9.69	24.04	0.08	10.19	56.00
11	*Tridax procumbens*	85.46	14.19	39.58	0.44.	4.88	40.91

Andropogon gayanus with dry matter 85.95% contained 12.31% CP, 37.76% CF, 14.37% Ash and 45.75% NFE. The DM, CF and ASH contents are in line with the findings of Gohl, 1981; who reported the species hay contained 88.5% DM, 6.1% CP, 35.1% CF and 49.2% NFE, while silage (DM 25.0%) contains 5.8% CP, 37.4% CF and 47.5% NFE. According to Gohl, the ME (metabolizable energy) for cattle ranges from 1.71 megacalories/kg DM in silage to 1.65 in hay, 2.02 in mature forage and 2.33 in early vegetative forage.

The *Acacia albida* contained 88.95% DM, 12.31% CP and 45.75% NFE. Hassan *et al.* (2007) reported that the concentrations of tested parameters in the seed and the pulp of *Acacia albida* respectively on % dry matter were: DM (90.0±0.4; 93.3±0.2), CP (14.6±1.2; 19.5±0.4) and NFE (46.1 ± 0.1; 50.53 ± 0.7).

Dougal and Bogdan (1936) reported early flower *Crotalaria retusa* with 21.50% CP, 20.40% CF, 46.34 NFE and 9.28% ASH. Research on the use of *Crotalaria* as a feed for livestock is very limited. The limited data that is available does not give quantitative investigations to establish the potential of *Crotalaria* spp. as a fodder plant. The only work that gives some detail

is that of Balaraman and Vankaterkrishman (1974) who determined the nutritive value of *C. juncea* by conducting a metabolism trial using rams. Intake on average was 2.57 kg of dry matter per 100 kg body weight. The digestibility coefficients on consumption basis showed that the portion consumed was highly digestible. However, on feed basis the digestibility coefficients were very poor due to the fact that the rams chose the leafier parts of the plant and rejected the stems.

Panicum maximum grazed by the sheep contained 89.32% DM, 11.44% CP, 26.42% CF, 12.50% Ash and 49.32% NFE. This is much in consonance with the findings of Gohl, 1981, who reported 88.9% DM, 11.90% CP, 31.70% CF, 12.00% Ash, 3.20% EE and 41.20% NFE.

Sorghum bicolor (leaf) contained 96.61% DM, 9.69% CP and 45.75% NFE. These compare favourably with the proximate result ranges reported by Miller (1958) which had DM range from 71.0–96.3%, averaging 89.0%. On a zero-moisture basis, CP ranged from 8.7–16.8% (mean of 1160 cases, 12.5%), EE from 1.4–6.1 (mean of 1159, 3.4%), CF from 0.4–13.4 (mean of 1085 cases, 2.7%), ash from 1.2–7.1% (mean of 1133, 2.2%), and 65.3–85.3% NFE (mean 79.2%). Palmer and Bowden (1975) report DM ranged from 62.8–94.3% (mean 85.5%). On a zero moisture basis, the dry roughage contained 3.0–17.9% CP (mean of 256 = 7.9), 1.4–3.8% EE (mean of 256 = 2.5), 17.3–38.1% CF (mean of 256 = 26.1) and 41.0–67.8% NFE (mean 55.0).

Feacal Output and Water Intake of Yankasa Sheep

Mean daily feacal output and water intake of Yankasa sheep grazing range pasture with supplementation were 328 g/head/day and 1385 ml respectively (Table 3). Kallah and Adamu (1988) estimated 200 g to be the daily feaces excreted by unsupplemented sheep under the agropastural system where the animal were kraaled at night without bedding material .The quantity of faeces available for collection in any livestock enterprise would be determined by the species, breed, age and size of the animal, type and nature of feed ingested, seasonal variation, length of kraaling and whether or not bedding is used (Kallah and Adamu, 1988, Winks *et al.*, 1976).

Table 3: Summary statistics of the measured characteristics of Yankasa sheep

Characteristics	N	Mean (±SE)	C.V
Initial body weight (kg)	88	19.41±0.63	30.35
Final weight (kg)	88	23.32±0.45	38.75
Total feacal output (g)	88	2308.75±35.36	14.37
Average daily feacal output (g)	88	327.93±5.06	14.48
Water intake (ml)	88	9642.22±240.06	23.36
Average daily water intake (ml)	88	1384.90±33.71	22.83

In this present study, the animals were individually penned on concrete floor which allows for more accurate collection of feaces, unlike when the animals were kraaled on the field and most of the feaces have mixed with sand making collection less accurate. The above reason might be responsible for the higher feacal output reported in the present study compared to what was reported by Kallah and Adamu (1988). This observation is in line with the findings of Winks *et*

al. (1978), who reported 33% increase in feacal output in cattle grazing the natural pasture and supplemented with urea molasses mixtures.

The male produced feaces of 322 g/head/day and the female produced feaces of 330 g/head/day. The effect of sex on the feacal output showed no significant difference (P>0.05) (Table 4). This trend was also observed with local (menz) and crossbreed (menz and Merino) sheep in Ethiopia (Sebsile, 1993). Osuhor *et al.* (2002) also reported that there was no significant (P>0.05) between the feacal output produced by male and female Red Sokoto goat (0.36-0.33 kg/head/day) respectively. Lamidi *et al* (2006) also observed these trends between Bunaji bull and cow (1.68-1.62 kg/hd/day) with no significant difference between sexes.

An average daily water intake of 1181 ml and 1461 ml for male and female respectively are shown in Table 4. The sex of the animal was found to have a significant effect on water intake (P<0.01). Water consumed by the sheep and rate of evaporation dropped significantly with increase in relative humidity during the experiment. The metereological data during the experiment is presented in Table 5.

Table 4: Mean weather report during the experimental period

Parameter	Mean	CV
% Relative humidity	35.94	1.12
Temperature (^{0}C)	30.04	0.99
Rainfall (mm)	1.22	4.19

Chemical Composition of Livestock Faeces

The chemical composition of faecal dropping of Yankasa sheep presented (Table 6) reveals that the female faecal droppings contain N 2.18%, P 0.47% and K 0.50 and that of the male contain N 2.13%, P 0.47% and K 0.50 and dry matter of both male and female is 96.40%**.**

The fertilizer value of sheep manure reported in the present study is higher in N, P and K value than 2.15, 0.27 and 0.89 respectively reported by Kallah and Adamu (1988). Osuhor *et al.* (2002) reported that Red Sokoto goat manure contain 2.81%, N 0.42%, P 0.93 K. Lamidi *et al.* (2007) also reported that faecal droppings by unsupplemented Bunaji cattle contains 1.79% N, 0.46% P, and 0.93% K and that of supplemented cattle contain 2.27% N, 0.52% P and 0.74% K.

Table 5: Chemical composition of feacal droppings from Yankasa sheep

Sample	Female	Male
DM%	96.56	96.49
Nitrogen%	2.18	2.13
Phosporus	0.48	0.46
Pottasium%	0.52	0.50

In Nigeria, NPK are the major nutrient in commercial fertilizer. It has been observed that livestock manure also contain Fe, Mn, Zn and Cu etc (Kallah and Adamu, 1988., Yaro *et al.*, 1997, Lupwayi *et al.*, 2000, Osuhor *et al.*, 2002 and Lamidi *et al.*, 2006).

Body Weight

The mean bodyweight of the Yankasa sheep is 19.41 kg with standard error of ±0.63. The mean body weight of the male is 16.8 kg and 20.4 kg for female and the effect of sex on body weight was found to be significant at P<0.01. The weight gain at the end of experiment is 3.90 kg with standard error of ±0.45 (Table 4). The mean weight gain for male is 4.50 kg and the female is 3.60 kg with standard errors 0.62 and 0.57 respectively (Table 7).

Table 7: Effects of sex on some measured characteristics of Yankasa sheep

Characteristics	**Male(24)**	**Female(64)**	**Level of significance**
Body weight	16.8 ± 0.56^{b}	20.4 ± 0.81^{a}	**
Water intake	7264.8 ± 89.54^{b}	11758.8 ± 304.63^{a}	**
Feacal output	2270.8 ± 43.92^{b}	2322.9 ± 45.80^{a}	**
Average daily water intake	1181.3 ± 12.35^{b}	1461.3 ± 43.39^{a}	**
Average daily feacal output	321.7 ± 6.02^{b}	330.3 ± 6.59^{a}	**

** = P < 0.01, ^{a,b} means within the same row with different superscript differ significantly (P<0.05).

Correlated Relationship between Measured Characteristic of Yankasa Sheep

The measured characteristics include initial weight, weight gain, water intake, faecal output, average daily water intake, average daily faecal output. All the measured characteristics were positively and significantly correlated between themselves. This indicates a proportional change in other characteristic when change occurs in one characteristic. However, no significant relationship was found between weight gain and water intake and also between weight gain and average daily water intake (Table 8).

Table 8: Correlation relationship between initial weight, weight gained, water intake, feacal output, average daily water intake and average daily feacal output

Characteristics	Initial weight	Weight gain	Water intake	Feacal output	Average daily water intake	Average daily feacal output
Initial weight	-	-0.43*	0.85**	0.89**	0.85**	0.88**
Weight gain		-	-0.33	-0.42*	-0.33	-0.47*
Water intake			-	0.79**	1.00**	0.78**
Feacal output				-	0.79**	0.97**
Ave. daily water intake					-	0.78**

CONCLUSION

The result of this study showed that a large amount of manure is produced by Yankasa Sheep which has a significant nutrient value for crops. When utilized, it will enhance crop livestock integration and reduce cost of inorganic fertilizer.

RECOMMENDATION

Research into method of reducing the bulkiness associated with the droppings is needed. I also propose a well planned field studies to demonstrate to farmers the economic benefit of using sheep manure especially given the increasing cost of organic fertilizer and the fact that the world is encouraging organic farming.

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