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Performance of Yankasa Sheep Fed Complete Rations Containing Inclusion Levels of Ensiled Sugarcane Waste with Poultry Litter

Research Article

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ABSTRACT

A feeding trial was conducted to assess the effect of inclusion of ensiled sugarcane waste (ESCW) with poultry litter on performance of Yankasa rams in a completely randomized design (CRD) for twelve weeks (84 days). Sugarcane waste was mixed with poultry litter in 3:1 and ensiled for 21 days. The ESCW was used as partial replacement in complete diet. Sixteen Yankasa rams (mean body weigh 28.94 ± 5.77 kg and aged 12 to 18 months) were allotted to the four groups on the basis of body weights into control group without ESCW (CG) or control diets as treatment groups (TGs) partially replaced with ESCW at 15% (TG1), 30% (TG2) or 45% (TG3). Diets were offered *ad libitum*, along with clean drinking water and mineral salt lick at will. The results showed no significant ($P>0.05$) differences in the treatment means of all the growth parameters evaluated, values recorded for TG3 (45%) were numerically higher in final live weight, weight gain and average daily gains (ADG). Significant ($P<0.05$) differences were recorded in dry matter and ash intakes while the dry matter, crude fibre and ash apparent digestibility differed significantly ($P<0.05$) among the CG and TGs. In conclusion, performances of Yankasa rams with 45% inclusion of ESCW were comparable to CG and its usage is therefore recommended as alternative choice during the lean periods based on the observed nutritional facts.

KEY WORDS ensilage, poultry litter, sugarcane waste, Yankasa rams.

INTRODUCTION

The semi arid zones represent a fragile environment with seasonal and occasionally much longer severe stress periods which impede the availability of feed. Adebowale (1981) stated that the dominant forage which is the natural pasture grassland grazed by ruminants and crop residues from farm lands in Northern Nigeria cannot meet the energy and protein requirement of the animals. The feed shortage is more severe from March to May. The detrimental effect of the long dry season in arid and semi-arid regions on quantity and quality of feeds available to livestock are well documented (Maigandi and Tukur, 2002; Maigandi and Bibi-Farouk, 2008; Sirajo *et al.* 2010). Ibeawuchi and Adamu (1990) estimated that as much as 15% of the animal body weight attained at the end of the previous rainy season could be lost during the following dry season. Small scale farmers cannot afford the investments required to establish improved pastures and feed concentrate supplements to alleviate dry season growth checks (Smith *et al.* 1991). Ngele *et al.* (2006) reported that the crude protein of rice straw could be improved with poultry litter especially in the ratio of 5:5 when ensiled for 21 days. Gerald and Thomas (2006) reported that unconventional feeds could be con-

served and their nutritional value improved by way of ensiling the feed material which aims at controlling microbial fermentation that could improve the feeding value of a feedstuff. Sugarcane waste is one of such unconventional feedstuffs which are produced in large quantities in the country and could therefore be used to feed livestock after ensiling with poultry litter to enhance nitrogen content and also digestibility. This study therefore aimed at determining the effects of treating sugarcane waste with poultry litter and its inclusion as graded levels in complete diets for Yankasa sheep as dry season feed. The objective of the study was to assess the effect of feeding complete diet containing graded levels of ESCW enhanced with poultry litter on performance, nutrients intake and nutrient digestibility of Yankasa rams.

MATERIALS AND METHODS

Experimental location

The study was conducted at the Small Ruminant Unit of the Livestock Teaching and Research Farm, Department of Animal Science, Kano University of Science and Technology, Wudil, Kano State, located in the Sudan Savannah Region of Nigeria. The site is situated between longitude $8^0$25'E and latitude 12 ˚58'N. The area has an average annual rainfall of 890 mm with a peak in August with an average annual temperature of 38 to 43 ˚C and relative humidity of 40 to 51% (Olofin *et al*. 2008). There are three distinct seasons recognized in the area viz: dry cold (October to January), dry hot (February to May) and wet (June to September).

Ensiling procedure and experimental materials

Sugarcane waste (SCW) was collected within and around Kano State, cleaned for extraneous materials like stones, iron and polyethene. Poultry litter (PL) was obtained from the deep litter poultry production system. The collected SCW and PL were sun dried for the period of 3 days during dry season by thinly spreading on a concrete floor. The dried sugarcane wastes used for the silage were chopped into about 2-3 cm length using forage chopper for better compaction (Ogunlolu *et al*. 2010). SCW was ensiled with PL (ESCW) in the ratio 75:25, for 21 days after wetting with water at the rate of 15 liter/25 kg mix in a 300-liter capacity plastic water reservoir as silo. Silo filled with weighed materials was covered with polythene and compressed by human trampling. Five hundred kilograms (500 kg) of the ESCW with PL was produced and used to formulate four diets (Table 1). Other concentrate feed ingredients included in the diets were maize, wheat offal, full fat soybean meal, cowpea husk and salt. The diets were fed *ad-libitum* as complete diet to all the experimental rams.

Experimental animals and management

Sixteen male Yankasa rams (Mean body weight 28.94±5.77 kg; aged 12 to 18 months) were purchased from the market and quarantined for two weeks. The rams were treated for internal and external parasites with Ivomec®–super at 200 µg/kg body weight subcutaneously before the start of the experiment. Rams were divided into 4 groups of 4 animals each in a completely randomized design (CRD) based on live weight (Steel and Torrie, 1980).

Control group (CG) was fed diet without ESCW while other 3 treatment groups (TGs) were fed 15, 30 and 45% of ESCW, respectively replacing the concentrate feedstuffs (Table 1). Rams were housed in individual pens measuring 2 m × 1 m. The pens were cleaned and disinfected using Omo® detergent and Moriguard®. Water and salt lick were provided *ad libitum*.

Data collection

The experimental animals were weighed individually prior to the commencement of the experiment and subsequently at weekly intervals between 8:00 am and 9:00 am before being offered feed. Daily records of feed intake were taken throughout the period of the experiment by weighing feed offered and left over the following day. Feed efficiency was calculated as the ratio of the feed intake to weight gain multiplied by 100% in all the replicates. The feeding trial lasted for twelve weeks which included digestibility trial consisted two weeks adaptation to fecal collection bags fitted on the first day and one week for fecal sample collection. During the collection period, daily feed intake and total fecal output from each animal were recorded. After thorough mixing, 5% of the air-dried fecal samples were sampled and oven dried at 60 ˚C for determination of digestible nutrients. Fecal apparent digestibility of the nutrients was determined for each diet using standard procedures outlined by AOAC (2005).

Chemical analysis

Thoroughly mixed representative samples of the experimental diets and faeces were analyzed for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), ash and nitrogen free extract (NFE) according to AOAC (2005) procedures.

Statistical analysis

Data were subjected to analysis of variance (ANOVA) using CRD and significant differences between the means were tested by least significant difference (Steel and Torrie, 1980).

Differences between the means were considered significant at 5% probability level ($P<0.05$). The data were analyzed using SAS statistical package (SAS, 1989).

Table 1 Composition (%) of complete experimental diets fed to Yankasa rams

Ingredients	CG (0%)	TG1 (15%)	TG2 (30%)	TG3 (45%)
Ensiled sugarcane waste with poultry litter (3:1)	0	15	30	45
Groundnut haulms	20	15	15	10
Wheat bran	20	20	15	15
Cowpea husk	20	20	15	15
Maize	19	14	9	9
Soybean meal	5	5	5	5
Rice milling waste	15	10	10	0
Salt	1	1	1	1
Total	100	100	100	100
Crude protein (CP) (%)	13.66	13.64	13.51	13.74
Cost of feed/kg diet (₦)*	53.25	50.85	45.77	45.26

CG: control group without ensiled sugarcane waste (ESCW); TG1: ESCW at 15%; TG2: ESCW at 30% and TG3: ESCW at 45%.
* $1: ₦ 160 as at the time of the experiment.

RESULTS AND DISCUSSION

Chemical composition (%) of the experimental diets

The results of the chemical composition of experimental diets are presented in Table 2. It can be seen that dry matter varied from 90.78% in CG to 94.80% in TG3. Percent DM values obtained in the present study were comparable and differed slightly from the DM values 94.00 to 95.00% reported by Sirajo *et al*. (2010) for diets containing graded levels of PL waste. The high DM values suggest a good source of energy and roughage that could enhance rumination and prevent digestive upset in the rumen of goats, sheep and cattle for the production of volatile fatty acids (VFA) (Van Soest, 1982). Crude protein content of the TGs varied from 14.39 to 14.87% while that of CG was 13.89%. The CP obtained in the present study was higher than the range of 10 to 12% recommended by Gatenby (2002) but lower than the ARC (1990) recommendation of 15 to 18% for growing sheep weighing 10 to 30 kg. Crude protein could be a single nutrient that could determine the quality of a feed as reported by McDonald *et al*. (1998). Therefore, in the present study CP of the diets were adequate for protein requirements of the animals. CF and EE contents in the TGs decreased with increasing proportion of ESCW due to replacement of concentrate feed stuffs at varying levels in comparison to CG.

The CF contents of the TGs were lower than CF values (27 to 32%) reported by Aliyu *et al*. (2012) when Yankasa rams were fed urea, poultry droppings or urea treated *Pennisetuim pedicellatum* (kyasuwa) grass. Ash content varied from 11.68% in CG to 8.13% in TGS and were comparable to report of Aliyu *et al*. (2012).

Growth Performance of Yankasa Rams fed inclusion levels of ESCW with PL

The results for growth performance of Yankasa rams fed graded levels of ESCW are presented on Table 3. There were no significant (P>0.05) differences in the means of all the variables evaluated between CG and any of the TGs. Final live weight and weight gains were not significantly (P>0.05) different among the treatment means but values recorded for TG3 were numerically higher which was due to concentrate feedstuffs which were replaced proportionately with ESCW. Body weight gains were comparable between CG and TGs although partially diet contains ESCW and in agreement with observations of Akangbe and Adeleye (2002) and Fajemisin *et al*. (2010). Average daily gain (ADG) was also comparable between CG and TGs however, numerically higher gains; 101.19 and 110.12 g/day were observed in CG and TG3 which was 15 to 20 g higher than either TG1 or TG2. Observed ADG in the present experiment was 2 folds lower than Uda rams which were fed *Faidherbia albida* leaves while replacing groundnut hay in diets (Maigandi *et al*. 2009). Feed intake which is a principle criterion for animal performance, was also unaffected due to replacement of ESCW in diets (P>0.05). Indeed, average daily feed intake 2.25 kg/d in TG3 was highest among CG and TGs. Comparatively higher feed intake in TG3 ascertained palatability of the diet with 45% inclusion of ESCW. Feed to gain ratio and feed efficiency were though better for TG3, it was comparable to CG and other TGs. Dry matter intake as percent of body weight did not differ significantly (P>0.05) between the CG and TGs but TG2 had the highest value, protein efficiency was lowest in TG1 and highest in TG3.

Nutrients intake (g/day) and apparent digestibility (%)

Data presented on Table 4 shows the nutrients intake and apparent digestibility by Yankasa rams fed graded levels of ESCW. Dry matter intake (DMI) did not differ significantly, although slight differences existed and highest value was at (TG3) 45% level of inclusion of ESCW, this may be due to the better intake of ESCW and the better utilization by the host animals. There were no significant (P>0.05) differences in CP intake between CG and TGs which ranged from 306 to 332 g/d. The CP contents and protein intake were enough to support the requirement of the animals. The crude fibre intake in CG was significantly (P<0.05) higher than TGs but, CF intake in TGs were comparable.

Table 2 Chemical composition (%) of experimental diets

Parameters	CG (0%)	TG1 (15%)	TG2 (30%)	TG3 (45%)
DM	90.78	92.21	94.80	93.33
CP	13.89	14.87	14.39	14.50
CF	26.09	25.29	22.88	20.60
EE	4.05	3.98	3.71	3.27
Ash	11.68	11.08	8.13	8.19
NFE	43.31	45.35	51.39	53.44

CG: control group without ensiled sugarcane waste (ESCW); TG1: ESCW at 15%; TG2: ESCW at 30% and TG3: ESCW at 45%.
DM: dry matter; CP: crude protein; CF: crude fibre; EE: ether extract and NFE: nitrogen free extract.

Table 3 Growth performance of Yankasa rams fed inclusion levels of ensiled sugarcane waste (ESCW) treated with poultry litter (PL)

Parameters	CG (0%)	TG1 (15%)	TG2 (30%)	TG3 (45%)	LSD
Initial weight (kg)	28.75	29.00	29.00	29.00	9.932
Final weight (kg)	37.25	36.25	36.75	38.25	8.497
Weight gain (kg)	8.50	7.25	7.75	9.25	2.322
Ave. daily gain (g/day)	101.19	86.31	92.26	110.12	27.637
Feed intake (g/day)	2204	2231	2243	2250	466.2
Feed:gain	22.21	26.30	25.35	21.61	9.745
Feed efficiency (%)	4.6	3.9	4.1	4.9	2.010
Dry matter intake as % body weight	5.38	5.69	5.83	5.50	0.523
Protein efficiency	0.34	0.26	0.29	0.35	0.142

CG: control group without ensiled sugarcane waste (ESCW); TG1: ESCW at 15%; TG2: ESCW at 30% and TG3: ESCW at 45%.
LSD: least significant difference.

Table 4 Intake and apparent digestibility of nutrients by Yankasa rams fed inclusion levels of ensiled sugarcane waste (ESCW) treated poultry litter (PL)

Nutrients intake (g/day)	CG (0%)	TG1 (15%)	TG2 (30%)	TG3 (45%)	LSD
DM	2000	2057	2126	2099	432.3
CP	306	331	322	326	66.9
CF	575^{a}	564^{ab}	513^{ab}	463^{b}	109.6
EE	89	87	83	73	16.8
Ash	257^{a}	247^{a}	182^{b}	184^{b}	45.6
NFE	1175	1235	1376	1427	274.9
Apparent digestibility (%)					
DM	71.04^{a}	67.54^{b}	67.36^{b}	70^{a}	1.632
CP	63.18	60.15	60.62	61	3.445
CF	57.33^{a}	52.67^{b}	52.89^{b}	53^{b}	1.475
EE	63.26	63.19	63.69	61	1.605
Ash	60.78^{a}	55.66^{b}	56.50^{b}	59^{a}	2.230
NFE	59.36	59.30	59.26	58	1.581

CG: control group without ensiled sugarcane waste (ESCW); TG1: ESCW at 15%; TG2: ESCW at 30% and TG3: ESCW at 45%.
DM: dry matter; CP: crude protein; CF: crude fibre; EE: ether extract and NFE: nitrogen free extract.
The means within the same row with at least one common letter, do not have significant difference (P>0.05).
LSD: least significant difference.

EE and NFE intakes in both the CG and TGs were comparable (P>0.05). Ash intakes were comparable (P>0.05) for TG3 and CG. Intakes of different nutrients observed in the present experiment were higher than the observations of Garba *et al*. (2010). Generally, the observed nutrient intakes agreed with the recommendations of ARC (2001), indicating that the intake of ESCW was enhanced. Apparent digestibility of the various nutrients is presented in Table 4. Crude protein (CP), ether extract (EE) and NFE apparent digestibility showed no significant (P>0.05) difference among the CG and TGs. Crude fibre digestibility was significantly (P<0.05) higher in CG than other TGs while DM and ash digestibility were significantly (P<0.05) higher in CG and TG3 compared to TG1 and TG2. The apparent digestibility of DM, CF and ash increased with increasing levels of ESCW in the diets. These results indicated that up to 45% of ESCW could be included in the diet of Yankasa rams for dry season feeding. However, the optimum results appeared at 45% ESCW inclusion.

CONCLUSION

The results of the study showed that inclusion at 45% level of silage from 75% SCW and 25% PL produces better performances indicating that as the levels of ESCW with PL increases performances were better. It is therefore recom

mended that ESCW could be included at 45% level when enhanced with PL at ratio 75SCW:25PL in complete diets as alternate choice of feed resource for sheep in the dry season.

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