DETERMINATION OF THE CHEMICAL AND MINERAL COMPOSITION OF CATTLE FORE-STOMACH DIGESTA (FSD) ENSILED WITH UREA AND RICE MILLING WASTE (RMW)

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ABSTRACT

Fore-Stomach Digesta (FSD) is the partly digested feed from slaughtered animals which offer a used option as a feed alternative. This study was conducted to determine the chemical and mineral composition of cattle Fore-Stomach-digesta (FSD) ensiled with Urea and rice milling waste (RMW). Fore-Stomach Digesta (FSD) from cattle was collected at the Sokoto abattoir. These samples were dried and then thoroughly mixed with urea and rice milling waste and ensiled for three weeks. The results showed that Dry Matter (DM) values of FSD from cattle was significantly higher ($P<0.05$) in the treatments that were not ensiled (treatment D) compared to those that were ensiled (treatments A, B and C). The crude protein (CP) contents 18-19% obtained from the present study were significantly higher ($P<0.05$) compared to that of FSD when not ensiled. The general trend in the nutrient detergent fibre (NDF) contents of the diets shows that unensiled materials (treatment D) contained more NDF than the other treatments. The implications are that treated in this way partly digested matter from slaughtered animals can provide a low cost, nutrient rich feed option for farmers especially in the dry season.

Keywords: Fore-Stomach Digesta,Cattle, Chemical composition.

INTRODUCTION

Fore-Stomach Digesta (FSD) includes all the materials from the fore-stomach compartments of camel and ruminant animals after cleaning out their guts is an abattoir waste product that can be obtained free of charge from most abattoirs in Nigeria Maigandi (2001). The chemical composition of FSD depends on the specie of animal, the type of feed consumed by the animal, the season of the year (Alhassan, 1985), the time of sampling from the animal (Riveira, 1977) and the type of treatment given to the FSD prior to analysis (Kumar, 1989).

Maigandi *et al.* (2002) reported that sometimes farmers use FSD as a source of organic manure and it has been realized that animals, especially ruminants, eat it up after it has been spread on farms, particularly during the late dry season when feeds are in short supply. Therefore the utilization of FSD as feed ingredient will provide a means of its disposal and lowering feed cost (Maigandi and Tukur, 2002). There is also the need to improve its quality.

Rice milling waste (RMW) is an agro-industrial by-product found in large quantities in areas where rice is produced abundantly and it is a potentially useful component of concentrate portion of diets for ruminants (Alawa and Umunna, 1993).

Urea as the commonest source of degradable nitrogen for inclusion in diets of ruminants and also can provide a substantial amount of the supplemental Nitrogen (N) required where livestock management is good and feed is formulated and mixed properly.

As Fore-Stomach-Digesta (FSD) cannot be fed alone to animals, it is necessary to improve it through some means (Anthony, 1971). Ensiling is one of the ways of improving and preserving the value of feeds for ruminant animals (McDonald *et al.*, 1995), therefore these methods can be used to improve and preserve Fore-Stomach-Digesta (FSD) for better utilization by ruminants.

MATERIALS AND METHODS

Sample collection and Preparation

Fore-Stomach Digesta (FSD) from cattle was collected at Sokoto abattoir. At least 5-10 animals that were brought to the abattoir for slaughter were selected for the collection. After slaughter and evisceration at least 0.5kg of the fresh FSD was collected from each animal. Samples were thoroughly mixed and representative samples were collected and were immediately transferred into an air-tight container and transported to the experimental site. Urea and Rice Milling Waste (RMW) were purchased.

Experimental Design and Ensiling Procedure

A factorial design in CRD (Steel and Torrie, 1980) was used in this experiment, with three replications each. The factor was the inclusion of RMW at graded levels in the FSD. The samples were thoroughly mixed and ensiled for a period of three weeks.

Twelve (12) bottles of 946ml capacity were used as laboratory silos (Ogunlolu *et al.,* 2010). The procedure of Roy and Rangnekar (2006) was followed in which 1kg urea was dissolved in 15 litres of water and sprinkled on 25kg FSD. The samples were ensiled for 21days in triplicate. Masking tape was used to further seal the bottles after filling weighed materials and compressed.

Chemical Analysis

After three weeks, the 12 ensiled samples were opened and collected for analysis. The samples were analysed for proximate composition by the AOAC (1990) procedures and for fibre fractions (ADF, NDF, ADL, cellulose and hemicellulose) using Goering and Van Soest (1970) procedures. Energy was calculated from the formula: 37 X %CP + 81 X %EE + 35.5 X % NFE (Pauzenga, 1985).

Statistical Analysis

Data collected from the proximate, fibre fractions and mineral analyses were analysed using analysis of variance (ANOVA) and treatment means were compared using the Least Significant Difference test (LSD) (Steel and Torrie, 1980).

RESULTS

Chemical Composition of Cattle Fore-Stomach Digesta ensiled with Urea and Rice Milling Waste

From table 1 it can be seen that the DM and OM was significantly ($P<0.05$) similar in treatments B, C and D but significantly lower in treatment A. CP content was significantly different ($P<0.05$) between treatments; with treatments D (19.63%) having significantly ($P<0.05$) higher value compared to the other treatments. There was no significant ($P>0.05$) difference between treatment means in the CF content. Also from the table it could be observed that the NDF content was significantly higher ($P<0.05$) in treatments A (67.90%) and D (70.00%) compared to treatments B (66.47%) and C (67.57%) whose values were similar. The Hemi-cellulose content was significantly higher ($P<0.05$) in treatment A (28.07%) compared to the other treatments whose values were the similar. In Table 2 the Calcium content was significantly higher ($P<0.05$) in treatment A (6.5%) compared to treatments B (5.3%) and D (5.2%) whose values were similar and also did differ with the lowest in treatment C (4.7%). The phosphorous content was significantly higher in treatment A with the other treatments whose values were similar. Also the Cobalt content was significantly higher ($P<0.05$) in treatment A (0.3%) but similar to treatment B (0.2%) whose value was also similar to treatment C (0.2%), but treatment D (0.1%) was significantly different and also the lowest value.

DISCUSSION

Chemical composition of Cattle Fore-Stomach Digesta (FSD) ensiled with urea and graded levels of Rice milling Waste (RMW)

Dry Matter (DM) values of FSD from cattle was higher in the treatments where FSD, Urea and RMW were not ensiled (treatment D) compared to those that were ensiled (treatments A, B and C). This might be due to the microbial activity as a result of ensiling FSD prior to the analyses (Kumar, 1989). The DM values obtained in this study were higher than those values (13-20%) obtained by Maigandi and Tukur (2002) when FSD was analysed alone. This might be due to the fact that ensiling improves value of feeds for ruminants (Mcdonald *et.al,* 1995). Also there were higher CP values in the FSD from cattle compared to those of Maigandi and Tukur (2002) and 12.04% for cowpea husk (Adeloye, 1994) as well as 2.4-6.4% obtained from cereal crop residues (Alawa and Umunna, 1993). The higher CP content in the present study might be due to the addition of urea, as urea adds nitrogen to feed material (Ben Salem and Smith, 2008) and therefore increase crude protein content.

The general trend in the NDF contents of the diets shows that unensiled materials contained more NDF which is an indication that it is bulkier than the ensiled materials. This clearly indicates that ensiling process had an effect on size particles of the experimental materials. This result could be predicted to means that unensiled feed materials in this experiment requires more chewing so as to reduce particle size (Varga *et al;* 1998). It means that when this diet is use in feeding animals there would be more regurgitation activities compared to the diets from other treatments.

NDF and ADF in the present study were higher than the average NDF of 42, 62 and 45 and ADF value of 39, 41 and 26 for legume, grass and corn forage silage respectively (Varga *et al;* 1998). The higher NDF in the present study increases the regurgitation activity in the animals which is one of the important characteristics in ruminants (Varga *et al.,* 1989).

Mineral Composition of Cattle FSD Ensiled with Urea and Graded Levels of RMW

The calcium: phosphorous ratio in the cattle FSD in this study are in line with what was reported by McDonald *et al.* (1995) that the calcium: phosphorous ratio considered most suitable for farm animals is within the range of 1:1-2:1, although there is evidence which suggests that ruminants can tolerate higher ratios provided the phosphorous requirements are met.

The cobalt content was within the normal range of 0.02-0.04 mg/kg as deficiency symptoms are said to occur where levels of cobalt in the herbage are below 0.1 mg/kg DM and also sheep are said to tolerate up to 3.5mg/kg as sheep are less susceptible to cobalt toxicosis than cattle (McDonald *et al.,* 1995).

CONCLUSION

This study concludes that chemical and mineral compositions were improved by ensiling Fore-Stomach Digesta (FSD) with Urea and Rice Milling Waste (RMW) at 75% and 50% inclusion level and also the general trend of the results indicated that FSD and RMW could be used in the diets of ruminant animals especially in the dry season.

RECOMMENDATIONS

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Table 1:Chemical Composition of Cattle Fore-Stomach Digesta (FSD) ensiled with urea and graded levels of Rice Milling Waste (RMW)

Variables (%)	Inclusion Levels of FSD (%)				SEM
	A (0)	B (75)	C (50)	D (50*)	
Dry Matter	88.84^{b}	89.83^{a}	89.93^{a}	89.51^{a}	0.20
Organic Matter	76.70^{b}	77.58^{a}	77.75^{a}	77.63^{a}	0.22
Crude Protein	18.63^{cd}	17.76^{d}	19.14^{b}	19.63^{a}	0.20
Crude Fibre	28.09	27.63	28.26	29.30	0.11
Ether Extract	5.64^{b}	5.08^{c}	5.53^{b}	6.67^{a}	0.10
Nitrogen Free Extract	35.51^{ab}	37.28^{a}	34.88^{b}	32.52^{c}	0.22
Ash	12.14^{ab}	12.25^{a}	12.18^{ab}	11.88^{b}	0.11
**ME (kcal/kg)	2406.75	2392.04	2394.35	2421.04	
Neutral Detergent Fibre (NDF)	67.90^{ab}	66.47^{b}	67.57^{b}	70.00^{a}	0.26
Acid Detergent Fibre (ADF)	39.83^{d}	41.17^{c}	42.03^{b}	43.60^{a}	0.21
Acid Detergent Lignin (ADL)	11.09^{c}	12.15^{b}	10.37^{d}	13.30^{a}	0.15
Cellulose	28.74^{c}	29.02^{c}	31.67^{a}	30.47^{b}	0.14
Hemi-cellulose	28.07^{a}	25.30^{b}	25.53^{b}	26.40^{ab}	0.28

Means on the same row with different superscripts are significantly different ($P<0.05$)
**Unensiled samples*

Table 2: Mineral Composition of Cattle Fore-Stomach Digesta (FSD) ensiled with urea and graded levels of Rice Milling Waste (RMW)

Variables (%)	Inclusion Levels of RMW (%)				SEM
	A (0)	B (75)	C (50)	D (50*)	
Calcium (Cå)	6.5^{a}	5.3^{b}	4.7^{c}	5.2^{b}	0.01
Phosphorous (P)	4.4^{a}	3.2^{b}	3.0^{b}	3.3^{b}	0.01
Potassium (K)	31.5^{a}	31.3^{a}	25.2^{b}	25.8^{b}	0.03
Magnesium (Mg)	4.2^{a}	4.1^{ab}	3.2^{c}	3.9^{b}	0.01
Cobalt (Co)	0.3^{a}	0.2^{ab}	0.2^{b}	0.1^{c}	0.00

Means on the same row with different superscripts are significantly different ($P<0.05$)
**Unensiled samples*