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Assessment of Nutrient Composition of Fore-Stomach Digesta (FSD) Ensiled With Groundnut Haulms

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ABSTRACT: A study was conducted to evaluate the proximate and mineral compositions of fore stomach digesta ensiled with groundnut haulms. Fresh fore stomach Digesta (FSD) was collected from slaughtered camels and cattle at Sokoto central abattoir and then ensiled with Groundnut haulms. The mixture was analyzed for proximate and mineral compositions after 3, 6 and 9 weeks of ensiling. Results showed that Moisture, crude fibre (CF), nitrogen free extracts (NFE) and ether extracts (EE) components increased with increase in ensiling period ($P< 0.05$) while crude Protein (CP) decreased with increase in ensiling period. Calcium, potassium and phosphorus composition of the ensiled components also increased with increase in period of ensiling while sodium and magnesium did not ($P< 0.05$). It could be concluded that increasing ensiling period beyond three weeks could decrease CP contents but could increase CF, NFE, Ca, P and K contents of the ensiled materials. Further studies should be carried out with other forage species to enhance the nutritive value of fore stomach digesta for its potential use as animal feed.

Key words: Proximate composition, fore-stomach digesta, ensiling, ground nut haulms.

INTRODUCTION

Nigeria is endowed with various species of livestock ranging from cattle, sheep, goats, camel to poultry (FDLPCS, 1992). Inadequate feeding constitutes one of the major constraints to successful livestock production (Olaloku, 1985). The problem is more severe during the dry season when livestock feed is scarce and animals subsist on very poor quality forages, leading to very low levels of performance (Steinbach, 1997). These and other factors such as rise in the price of conventional feed and feed ingredients limited the productivity of livestock in Nigeria. It therefore becomes imperative to look for alternative sources of feeds in order to maximize livestock performance (Gerald and Thomas, 2006).

Groundnut (*Arachis hypogaea*) is one of the key crops of the semi-arid tropics. It is commonly cultivated as commercial crop and for man as food. the crop also provides pods and haulms for livestock feeding (Larbi *et al*., 1999, Omokanye *et al.,* 2001). Ramadevi *et al.* (2000) indicated that food from grain and as well as pods from the crop residues almost contribute equally to livelihoods in mixed-crop livestock systems.

Fore-stomach digesta (FSD) is a by-product, which could be obtained freely from abattoirs in the country. Due to lack of adequate waste disposal facilities, it is often left to decay, thus generating repulsive odor providing condition favourable for the proliferation of parasites and pathogens and their intermediate hosts (Maigandi and Tukur, 2002).. Its utilization as a feed ingredient will therefore provide means of disposal in addition to lowering feed cost (Maigandi and Tukur, 2002).

Ensiling is a controlled microbial fermentation that could improve the feeding value of feed ingredients (Gerald and Thomas, 2006). Therefore, the palatability and feeding value of FSD could be enhanced by ensiling process. It is a form of heat treatment applied to crop residues and Agro industrial by-products in order to offer satisfactory control over pathogens, and improve their nutritive value (UNPAC, 1989). Ensiling FSD could allow the production of lactic acid that may essentially eliminate bacterial pathogens and parasitic nematodes (Anthony, 1971). It is a form of improving FSD and Groundnut haulms by mixing with ingredients (fermentable) and consolidated materials in a fresh uncontaminated state and tightly packed in a suitable condition (Jakhmola *et al.,* 1984). This

study was designed to find out the effect of ensiling at different combination on the chemical and Mineral composition of FSD mixed with groundnut haulms.

MATERIALS AND METHODS

Experimental Location: The study was conducted at Sokoto central abattoir located in Sokoto North Local Government of Sokoto State. Sokoto state is located within Sudan savannah zone in the north western part of Nigeria. It falls within longitudes 3-6^{O} E and latitudes 8-13^{O} N (Mamman *et al.,* 2000). Sokoto has a semi arid climatic condition, characterized by low rainfall varying widely in amount from year to year (500-1300mm) and long dry season. Diurnal and seasonal temperature fluctuations are very wide. Maximum temperature of 41^{o}C is attained in April while minimum temperature of 13.2^{O} C occurs in January (Mamman *et al.,* 2000). Humidity is very low during most part of the year and solar radiation is relatively high due to dry atmosphere and clear skies (Mamman *et al.,* 2000).

Sample collection and preparation: FSD samples were obtained from 40-50 % of the animals brought for slaughter. After slaughter and evisceration, 5.0 kg of the fresh FSD was collected each from cattle and camel selected for the study. The FSD was bulk together and thoroughly mixed with hands in order to get uniform and representative samples. The samples were taken to the farm immediately for ensiling. Groundnut hay was made ready before FSD collection. The representative samples from the FSD of camel and cattle were thoroughly mixed with groundnut haulm, and immediately ensiled using air tight containers.

Experimental treatments: Fresh FSD samples and groundnut haulm was mixed for ensiling in the following order:

Treatment 1 constituted 50% camel FSD and 50% groundnut haulms ensiled for 3, 6 and 9 weeks ensiling period. Treatment 2 constituted 75% camel FSD 25% groundnut haulms ensiled for 3, 6 and 9 weeks ensiling period. Treatment 3 constituted 50% cattle FSD and 50% groundnut haulms ensiled for 3, 6 and 9 weeks ensiling period. Treatment 4 constituted 75% cattle FSD and 25% groundnut haulms ensiled for 3, 6 and 9 weeks ensiling period. Treatment 5 constituted mixture of cattle FSD 25% Camel FSD 25% and Groundnut haulms 50% ensiled for 3, 6 and 9 weeks ensiling period. Treatment 6 constituted mixture of cattle FSD 50% Camel FSD 25% and Groundnut haulms 25% ensiled for 3, 6 and 9 weeks ensiling period.

Each treatment was replicated three times to make a total of fifty four samples. Eighteen (18) samples were removed each at interval of three weeks, six weeks, and nine weeks, for laboratory analysis.

Analytical Techniques: Mixed representative samples of fore stomach digesta ensiled with Groundnut haulms for the three different intervals were analyzed using the procedures of the Association of Official Analytical Chemists (AOAC, 1990).

Statistical Analysis: Data generated from the experiment were analyzed using Statview Statistical Package (SAS, 1998).

RESULTS

Table 1 shows the proximate composition of fore stomach digesta. Moisture contents increased with increase in period of ensiling. It was higher at week 9 for treatments 2, 5 and 6 (86, 86 and 87% respectively) ($P< 0.05$). Inversely, Crude Protein (CP) levels decreased with increase in period of ensiling. It was higher at week 3 for treatments 1 and 4 (1.9%) and lower for treatment 2 (1.3%) ($P> 0.05$). Crude fibre (CF) increased from 0.5% at week 3 for treatment 5 to 1.9% at week 9 for treatment 3 ($P< 0.05$). Ether extract (EE) was lower at week 3 for treatment 6 (2.2%) and higher at week 9 for treatment 4 (5.2%) ($P< 0.05$). Nitrogen free extracts (NFE) increased with increase in the period of ensiling. It was lower (at week 3) for treatment 3 (80%) and higher (at week 9) for treatment 6 (94%)($P< 0.05$).

The mineral composition of the ensiled fore stomach digesta is shown in Table 2. Sodium (Na) level (mg/ Kg) decreased with increase in period of ensiling. It was higher at week 3 for treatment 3 (186) and lower at week 9 for treatment 5 (155) ($P< 0.05$). Potassium (K), calcium (Ca) and phosphorus (P) contents increased with increase in period of ensiling. K increased from 567 mg/Kg at week 3 for treatment 6 to 1166 mg/Kg for treatment 1 at

week 9 (P< 0.05). Ca level increased from 0.02 mg/ Kg at week 3 for treatment 6 to 0.48 mg/Kg at week 9 for treatment 5 (P< 0.05). P level increased from 2.6 mg/ Kg at week 3 for treatment 3 to 3.7 mg/ Kg at week 9 for treatment 1 (P< 0.05) (table 2). On the contrary, magnesium (Mg) level decreased from 0.9 Mg/ Kg at week 3 for treatment 4 to 0.01 Mg/ Kg at week 9 for treatment 3 (P< 0.05).

Table 1: Proximate composition of ensiled fore-stomach digesta ensiled with groundnut haulms

Parameter(%)	**Treatments**						
	1	**2**	**3**	**4**	**5**	**6**	**SEM**
Moisture 3	77.83^{c}	78.83^{b}	80.41^{b}	76.24^{c}	85.16^{b}	84.00^{a}	0.18
Moisture 6	83.50^{b}	85.50^{a}	83.83^{b}	80.00^{c}	85.83^{a}	85.66^{a}	0.22
	84.66^{b}	86.16^{a}	84.76^{b}	81.66^{c}	86.16^{a}	86.83^{a}	0.38
Moisture 9							
CP 3	1.92^{a}	1.78^{c}	1.60^{d}	1.91^{a}	1.83^{b}	1.85^{b}	0.32
CP 6	1.67^{b}	1.32^{d}	1.94^{a}	1.51^{c}	1.69^{b}	1.47^{c}	0.33
CP 9	1.57^{a}	1.34^{c}	1.60^{a}	1.38^{c}	1.45^{b}	1.37^{c}	0.09
CF 3	1.66^{a}	1.00^{bc}	1.16^{b}	1.00b^{c}	0.50^{d}	0.66^{c}	0.08
CF 6	1.66^{b}	1.14^{d}	1.83^{a}	1.38^{c}	1.33^{c}	1.16^{d}	0.03
CF 9	1.82^{b}	1.50^{c}	1.94^{a}	1.83^{b}	1.45^{c}	1.45^{c}	0.16
EE 3	2.66^{bc}	3.83^{a}	4.00^{a}	3.16^{b}	2.66^{bc}	2.16^{c}	0.16
EE 6	4.16^{b}	4.66^{a}	4.16^{b}	4.33^{b}	4.16^{b}	3.16^{c}	0.20
EE 9	4.50^{b}	4.83^{a}	4.50^{b}	5.16^{a}	4.83^{a}	3.83^{c}	0.18
NFE 3	89.92^{a}	90.55^{a}	80.39^{c}	88.98^{b}	87.66^{b}	90.39^{a}	0.17
NFE 6	89.24^{a}	92.72^{a}	80.38^{b}	91.26^{a}	90.97^{a}	94.52^{a}	0.83
NFE 9	91.07^{a}	92.72^{a}	84.50^{b}	91.58^{a}	93.66^{a}	94.52^{a}	0.83

Means in the same row with different superscripts are significantly different (P< 0.05)
3, 6, 9 represents the length of ensiling period (in weeks)

DISCUSION

Increase in moisture content with increase in ensiling period could be due to increase in moisture production brought about by increased fermentation. It was earlier reported by Nelson *et. al.* (1976) that fermentation could induce anaerobic respiration which could subsequently release moisture as one its by-products. Differences in moisture between the treatments could be brought by the effects of ensiling procedure. However, the moisture value obtained was lower than the value of 90% reported by Boda (1990). Decrease in protein level with increase in ensiling period could be due to prolonged exposure to heat, which is known to reduce crude protein level of diets (Holmes, 1989). Variation in CP values between the treatments could be brought about by other factors that could affect CP composition of FSD. According to Alhassan (1985) the composition of FSD depends on the specie of animal, the type of feed consumed, the season of the year and the time of sampling after feeding. The crude protein content of the ensiled samples obtained was much lower than the range of 8-16 % reported by Maigandi and Tukur (2002) and Kamphues (1980). The crude fibre level of the ensiled materials increased with increase in ensiling period. This suggested that length of ensiling May increases the crude fibre level of a diet. The CF level recorded contradicted those reported by Kumar (1989). Increase in CF levels could also be attributed to the decrease in the CP levels as reported by Ademosun (1985). The EE obtained from the study was significantly lower than the value of 10.3 and 10 .4 % reported for cattle and camel respectively by Maigandi and Tukur (2002). Increase in EE level with increase in period of ensiling might be due to increase in NFE level from week 3 to week 9.

Decrease in sodium and magnesium levels with increase in ensiling period could be attributed to increase in moisture content. Increased moisture content had been reported to affect mineral salts contents of forages (Oyenuga, 1968). Increase in calcium, potassium and phosphorus contents

could be brought by increased fibre contents with increase in the period of ensiling. The calcium levels of the ensiled materials at week nine is similar to the values reported by Maigandi and Owanikin, (2002). Inversely, potassium and magnesium levels obtained were lower than the values reported by Maigandi and Owanikin, (2002). This variation could be brought by the differences in ensiling procedure, materials used, processing methods and length of ensiling period.

Table 2: Mineral composition of ensiled fore-stomach digesta ensiled with groundnut haulms

Parameter (Mg/ Kg)	**Treatments**						
	1	**2**	**3**	**4**	**5**	**6**	**SEM**
Na 3	171.66 [b]	185.50 [a]	186.33 [a]	184.83 [a]	163.00 [c]	183.66a	2.09
Na 6	169.00 [b]	179.00 [a]	183.50 [a]	179.16 [a]	157.50 [c]	175.00 [b]	1.29
Na 9	165.83 [b]						
		157.16 [ab]	182.66 [a]	164.16 [b]	155.33 [c]	161.33 [b]	2.61
K 3	966.10 [ab]	1000.33 [a]	755.67 [b]	933.19 [ab]	866.64 [b]	566.47 [c]	44.44
K 6	1066.66 [a]	1033.00 [a]	866.66 [c]	933.33 [b]	933.17 [b]	866.66 [bc]	36.92
K 9	1166.24 [a]	1066.66[ab]	1066.66 [ab]	966.15[b]	1033.33 [b]	1100 [a]	46.54
Ca 3	0.03 [b]	0.04 [ab]	0.05 [a]	0.03 [b]	0.05 [a]	0.02 [c]	0.01
Ca 6	0.32 [a]	0.25 [b]	0.20 [c]	0.26 [a]	0.27 [a]	0.26 [b]	0.00
Ca 9	0.47 [a]	0.38 [b]	0.47 [a]	0.37 [b]	0.48 [a]	0.35 [b]	0.02
Mg 3	0.72 [c]	0.88 [ab]	0.76 [b]	0.91 [a]	0.78 [b]	0.71 [c]	0.03
Mg 6	0.25 [b]	0.36 [a]	0.18 [bc]	0.35 [a]	0.16 [c]	0.21 [b]	0.00
Mg 9	0.02 [b]	0.02 [b]	0.01 [c]	0.02 [b]	0.02 [b]	0.03 [a]	0.03
P 3	3.24 [ab]	3.48 [a]	2.64 [c]	2.97 [bc]	2.84 [bc]	3.15 [b]	0.02
P 6	3.58 [a]	3.53 [a]	3.13 [c]	3.18 [c]	3.22 [b]	3.33 [b]	0.03
P 9	3.68 [a]	3.59 [b]	3.63 [ab]	3.61 [b]	3.50 [c]	3.53 [c]	0.06

Means in the same row with different superscripts are significantly different (P< 0.05)
3, 6, 9 represents the length of ensiling period (in weeks)

Conclusion and Recommendations: It was concluded that ensiling of fore stomach digesta (FSD) with groundnut haulms could reduce crude protein contents of the material. However, it could increase fibre, carbohydrate, Ca, P and K contents of rumen contents. These chemical compositions are comparable with those of some conventional feedstuff. They could therefore be used to replace some conventional feeding materials in order to reduce the problem of feed scarcity particularly during the dry season. It could also ease the disposal of FSD in the abattoir.

A Three week ensiling period should be adopted because it provides higher nutrient levels. The use of FSD in formulating supplement diets especially during dry season should be encouraged as the practice will help to reduce cost of feeding and minimize environmental hazards caused by abattoir wastes. Further studies should be encouraged on the feeding values of FSD to comprehensively evaluate its potentials as a feedstuff.

REFERENCES

A.O.A.C (1990). *Association of Official Analytical chemists. Official Methods of Analysis,(15th ed). Vol.1. Arlington, Virginia.*

Ademosun, A.A (1985). Nutritive evaluation of Nigerian forages: the effect of stage of maturity on the nutritive value of *Panicum maximum. Nig. Agric. J., 10:170-177*

Alhassan,W.S (1985). The potential of Agro-Industrial by-product and crop residue for sheep and goat production in Nigeria. Proceeding of the National Conference on small Ruminant Production. NAPRI, Zaria pp 165-183.

Anthony, W.B (1971). Animal Waste value, nutrient recovery and utilization. *Journal of Animal Science.* 32,799-807

Boda, k. (1990). (ED). Non-conventional Feedstuffs in the Nutrition of Farm Animals. *Elservier* Science Publishing Company Inc.

FDLPCS (1992). Nigerian Livestock Resource Vol. 11 National Synthesis, Federal Department of Pest Control Services. Resources Inventory and Management LTD, *St Helier Jersgy* U.K.

Gerald, M. W and M. Thomas (2006) processing cattle waste for recycling as animal feed, *world animal review. http:/www.fao.org/ag/Aga.com cited june 13, 2009.*

Holmes, W. (1989). *Grass; its production and utilization (2nd edition).* British Grassland Society. Blackwell Scientific Publications.

Jackhloma, R.C Dan Manmakara, R. Wars and N.N. Pathak (1984). Fermentation of cattle waste for animal feeding. *Agricultural waste. 3:10.*

Kamphues, J. (1980). Investigation of the possibilities of preserving and of the Nutritive value, composition, acceptability and digestibility of the stomach content of the slaughtered animals, cattle and pigs. *Msc.* Thesis, *Tierarztliche hochschule Hamnorer.*

Kumar, M. (1989). Processing animal by-products in developing countries. *A Manual of Commonwealth Science Council. Commonwealth Secretariat, London.*

Larbi, A., Dung DD, Olorunju P.E., Smith J.W., Tanko R.J., Muhammad I.R and I.O Adekunle (1999). Groundnut *(Arachis hypogaea)* for food and fodder in crop-livestock systems: forage and seed yields, chemical composition and rumen degradation of leaf and stem fractions of 38 cultivars. *Animal Feed Science and Technology* 77:33–47.

Maigandi, S.A and O.T. Owanikin, (2002). Effect of drying methods on the mineral composition of fore-stomach digesta (FSD). Proceeding of the 7th Annual Conference of *Ani*. Sci. Ass. Of Nigeria (ASAN) 16-19 *sept*, 2002, University of Agriculture, Abeokuta, Nigeria. 196-198.

Maigandi, S.A and H.M Tukur (2002) potential of fore-stomach digesta (FSD) as unconventional feed ingredient. *Journal of agriculture and environment 3(1):55-64*

Mamman, A.B, Oyebanji, J.O and S.W Peters (2000). *Nigeria A people united A future assured (survey of states)* vol.2 *Gabumo* publishing co. Ltd calabar Nigeria

Nelson B D, Montegomery., C.R. Schilling., P.E and L. Mason (1976). Effects of fermentation time on in vivo/in vitro relationships. *Journal of Dairy Science* 59:270-277. NO. 23. FDL 8, PCS

Olaloku, E.A (1985) Small ruminant production in West Africa. Objectives and research approaches. In. *Small ruminant production in Nigeria. (Adu, I.F.,Osinwo, O.A,Taiwo B.B.A and Alhassan, W.S., eds) Proceedings of National Conference on small Ruminant production, NAPRI, Shika, A.B.U., Zaria, Nigeria, 6-10 October.*

Omokanye A.T., Onifade O.S., Olorunju P.E., Adamu A.M., Tanko R.J and R.O Balogun (2001). The evaluation of *dualpurpose* groundnut *(Arachis hypogaea)* varieties for fodder and seed production in Shika, Nigeria. *Journal of Agricultural Science* 136:75–79.

Oyenuga, V.A (1968). *Nigeria Food and Feeding Stuffs. Their chemistry and nutritive value*. Ibadan University Press, Ibadan Nigeria.

Ramadevi, K., Bandyopadhyay R., Hall A.J., Indira S., Pande S and P. Jaiswal (2000). Farmers' perceptions of the effects of plant diseases on the yield and nutritive value of crop residues used for pre-urban dairy production on the Deccan Plateau: Findings from participatory rural appraisals. *Information Bulletin no. 60. Patancheru* 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 35 pp.

SAS (1998). Startview Statistical Package. SAS Inc. New York.

Steinbach,J (1997) Alternative to crop residue as feed resource in mixed farming system. In; Residues in sustainable mixed International crop/Livestock farming system (*Renard* C. Ed) CAB, Netherland.

UNPAC (1989). United Nation Protein Advisory Committee. Committee report, 989. USA