DRY MATTER INTAKE BY N'DAMA CALVES FED UREA TREATED MAIZE STOVER AND *CENTROSEMA PUBESCENS*.

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ABSTRACT

Maize stover consists of the leaves and stalks of maize plants left in the field after harvest and it makes up about half of the yield and is similar to straw. Ensiling maize stover with urea makes it a urea treated maize stover. Centrosema pubescens is a legume in the family Fabaceae, subfamily Faboideae and tribe Phaseolae. It is a native to Central and South America and cultivated in other tropical areas as forage for livestock. An experiment was conducted to investigate the dry matter (DM) intake in N'dama calves fed untreated maize stover with Centrosema pubescens (Diet T_1) and 5% urea treated maize stover with Centrosema pubescens (Diet T_2). Eight N'dama calves were assigned according to the initial body weight into two groups and randomly allotted to the diets. The animals were kept in individual pens with free access to feed and water. Dry matter intake per unit of metabolic weight was higher ($p < 0.01$) in N'dama calves fed Diet T_2 compared to Diet T_1. In conclusion, urea ammoniation may improve the dry matter intake of maize stover in N'dama calves.

INTRODUCTION

The problems of ruminant feeding have received considerable attention in the tropics and sub-tropics (Tesfayohannes, 2003). Most of the research has focused on treating roughage in the late dry season when the quality and quantity of food supply from natural pastures become limiting. Moreover, ruminant animals have evolved the ability to utilize and digest fibrous material. In contrast to the situation in the tropics and sub-tropics, in many developed countries, foods that are suitable for human consumption are very often used for feeding both monogastric and ruminant animals. According to the report by Orskov (1998) it has been suggested that ruminants should be fed, as much as possible, roughage based diets and other feeds that are not directly used by humans (Orskov, 1998).

Even though maize stovers are the most abundant of all agricultural residues and have a great potential as a feed-stuff for ruminants. It appears that 1ivestock production based on these stovers is rather low (Tesfayohannes, 2003). Verma and Jackson (1984) reported that nearly half of the world's bovine population is reared and maintained on diets composed of 50% or more stovers. Thus, these animals are the worlds least productive in terms of annual output per animal. The reasons for this low level of production are the low digestibility and intake of the maize stover based diets (Khanal *et al.*, 1999). According to Coxworth *et al.* (1977) the voluntary intake and digestibility of maize stovers are limited by its high lignin content, the manner in which this indigestible material is bound to the digestible cellulose and hemicelluloses and its low nitrogen concentration. The findings of Kamstra *et al.* (1958) and Van Soest (1967) reported that poor digestibility is related to the extent of lignifications of the cell wall components of the low quality roughages. The degree of fill in the reticulo-rumen has also been suggested as the dominant factor limiting voluntary intake of poor quality roughage diets because they have relatively long rumen retention times (Orskov, 1998). However, decreasing the retention time by increasing the rate of passage tends to decrease the extent of fiber digestion in the rumen (Van Soest, 1982).

Low quality roughages including straws, stovers, husks and other crop by-products make up a major portion of animal feed in many developing countries (Ali *et al.*, 2012). Expensive concentrates and milling by-products are forcing farmers to rely more upon crop by-products as source of energy (Ali *et al.*, 2012). Performance of animals fed crop residues is limited by poor intake, low nitrogen content, and lower digestibility (Peterson *et al*., 1981).

Chemical treatment has been used to improve the feeding value of crop residues (Waller, 1976). Among chemicals, ammonia and urea have received a considerable attention (Dias-Da-Silva and Sundstol, 1986) because these chemicals make the treated materials more palatable by solubilizing the hemicellulose fractions, thus improving the dry matter digestibility and daily dry matter intake (Saenger *et al*., 1982). Therefore, the objective of this study was aimed at determining the dry matter intake of urea treated maize stover with *Centrosema pubescens* in N'dama calves.

MATERIALS AND METHODS

Location and Duration of Study

The study was carried out in the Cattle unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka lies on the geographical coordinates of 6^0 52' 0" N, 7^0 23' 0" E and on the altitude 447m above sea level (Offomata, 1975). The climate of the study area is typically tropical, with relative humidity ranging from 65-80% and mean daily temperature of 26.8^{0}C (Agbagha, *et al.*, 2000). The rainy season of

Nsukka is between April to October and dry season between November to March with annual rainfall range of 1680-1700mm (Breinholt *et al*., 1981). The experiment lasted for 14 days adaptation and 90 days experimental periods.

Feed Preparation

Maize stover of an improved sweet variety (*Zea mays*) was collected from the Department of Crop Science Farm, University of Nigeria, Nsukka after the maize cobs had been harvested. The maize stover was allowed to dry in the sun at constant moisture level. Both the maize stover and the fresh leaves of *Centrosema pubescens* was chopped to 6-8mm, then the maize stover was treated with 5% urea (5kg urea dissolved in 50 litter of water for every 100kg of maize stover) and ensiled in 0.2mm thick polyethylene bags of dimensions 112 x 76cm for three weeks. The maize stover was thoroughly hand mixed so that the urea solution was uniformly mixed with the maize stover. 50% untreated maize stover plus 50% *Centrosema pubescens* served as the control Diet T_1 while 50% treated maize stover plus 50% *Centrosema pubescens* served as the Diet T_2.

Experimental Animals and Management

Eight N'dama calves between the age of 5 and 8 months were randomly allocated to two treatments with four calves per treatment. They were housed in individual compartment in the Cattle unit of the Department of Animal Science, University of Nigeria, Nsukka Teaching and Research Farm.

Treatment one was fed Diet T_1 while treatment two was fed Diet T_2 in the morning before they are allowed to go about their normal grazing and after grazing they are returned back to their individual compartment to continue feeding on the experimental diets.

All the calves were allowed free access to mineral/vitamin blocks and ample drinking water *ad libitum*. Cleaning of the compartments, removal and weighing of leftovers from previous day were done daily before supplying each day's diet. The animals were weighed monthly. The experiment lasted for 14 days adaptation and 90 days experimental periods.

Statistical Analysis

Data were analyzed using the Students T-test, for a completely randomized design with two treatments.

RESULTS

Table 1: Proximate analysis of the experimental diets

	Treatment groups				
Parameters	T_1	T_2	SEM	T	Prob.
Ash	8.16^{b}	10.65^{a}	0.013	-138.952	0.000^{**}
Ether extract	0.71^{a}	0.60^{b}	0.130	5.824	0.028^{*}
Crude fibre	43.00^{a}	27.03^{b}	0.058	157.983	0.000^{**}
Crude protein	18.90^{b}	24.27^{a}	0.015	-240.154	0.000^{**}
Nitrogen free extract	29.00^{b}	37.47^{a}	0.058	-83.713	0.000^{**}

Ash

The mean ash percentage values for the experimental diets of T_1 and T_2 were 8.16 and 10.65 respectively. The result indicated highly significant ($p<0.01$) differences on the ash

percentage values between the experimental diets. Diet T_2 had higher ash percentage value than diet T_1.

Ether extract

The mean ether extract percentage values for the experimental diets of T_1 and T_2 were 0.71 and 0.60 respectively. The result showed significant differences between the ether extract values for the experimental diets. Diet T_1 had higher ether extract percentage value than diet T_2.

Crude fibre

The mean crude fibre percentage values for the experimental diets of T_1 and T_2 were 43.00 and 27.03 respectively. The result indicated highly significant ($p<0.01$) differences between the crude fibre contents of the experimental diets.

Crude protein

The mean crude protein percentage values for the experimental diets of T_1 and T_2 were 18.90 and 24.27 respectively. The result indicated highly significant ($p<0.01$) differences between the crude protein percentage values for the experimental diets. Diet T_2 had higher crude protein percentage than diet T_1.

Nitrogen free extract

The mean nitrogen free extract percentage values for the experimental diets of T_1 and T_2 were 29.00 and 37.47 respectively. The result indicated highly significant ($p<0.01$) differences between the nitrogen free extract percentage values for the experimental diets. Diet T_2 had higher nitrogen free extract percentage value than diet T_1.

Table 2: Daily dry matter intake by N'dama calves

Parameters	T_1	T_2	SEM	t	Prob.
Daily Feed Intake g/d	259^b	359^a	0.079	-8.815	0.000^{**}
Daily Dry matter intake g/d	230^b	295^a	0.066	-6.988	0.000^{**}

Dry matter basis, each value represents the mean of four calves

Daily feed intake

The mean daily feed intake values for the N'dama calves on diet T_1 and T_2 were 259 and 359 respectively. The result showed highly significant ($p<0.01$) differences between the treatment groups. The results pertaining to daily feed intake was higher among N'dama calves on diet T_2 than those on diet T_1.

Dry matter intake

The mean dry matter intake values for the N'dama calves on diet T_1 and T_2 were 230 and 295 respectively. The result indicated significant ($p<0.01$) differences between the treatment groups. N'dama calves on diet T_2 had higher dry matter intake value when compared with those on diet T_1.

DISCUSSION

The observations made in the present study pertaining to the values of ash, crude fibre, crude protein and NFE were higher than those reported by Wang et al., 1964; Saengert *et al*., 1982 and Ali *et al*., 2012. The increased crude protein content of diet T_2 was due to ammoniation

of the maize stover in the diet and this supported the findings of Saenger *et al*., (1982); Tesfaye, *et al*., (2005) and Ali *et al*., (2012) who all reported increased crude protein of various crop residues when ammoniated. The reduced crude fiber in diet T_2 was due to the urea treatment of the maize stover which is in agreement with the earlier work of Saenger *et al*., (1982) which suggested that the crude fibre becomes more digestible after treatment with urea. The import of this study is that urea ammoniation of maize stover increased the dry matter digestibility and is a readily available nutrients in the rumen of the N'dama calves. This supports the observations made by Oji *et al*., (1977) who reported improved dry matter digestibility of maize by treatment with aqueous NH3 at 3% of dry matter. This is in disagreement with Kunkel *et al*., (1980) who found that soybean meal supplement had no effect upon dry matter digestibility of corn stover silage.

Generally, the daily feed intakes of N'dama calves in both treatments were above the levels recommended by Kearl (1982) for animals of comparable live weight to produce a daily weight gain of 250 to 500 g, though only the daily weight gain of calves fed diet T_2 falls within that range (303g). With regard to crude protein intake, the daily intake of calves fed the diet containing urea treated maize stover was significantly ($p<0.01$) higher than the intake of those fed diet T_1.

The results showed that N'dama calves fed diet T_2 had the better dry matter intake than those fed control diet T_1. These results are supported by the findings of Peterson *et al*., (1981), who recorded an increase ($p<0.05$) in dry matter intake by lambs fed on 2 to 4% ammonia-treated corn stalks compared to those fed untreated corn stalks (398 versus 997 g/day). Garret *et al*., (1979) also reported higher ($p<0.05$) dry matter intake when ammoniated corn stover was fed to sheep. Similarly, in cattle, higher daily dry matter intake was observed for ammonia treated stover compared to control (Saenger *et al*., 1982). However, Ward and Ward (1987) could not find any significant differences in dry matter intake in beef cows fed ammoniated warm season grass hay compared to untreated hay. Tariq *et al*., (2009) recorded lower dry matter intake in buffaloes fed Jambo grass silage compared to control group fed conventional fodder i.e. Jambo grass. Animals fed with basal diet mixed with stover treated with 5.8% urea or 5.8% urea + 10% cattle wastage also showed improved dry matter intake compared to untreated control group. Improvement of dry matter intake by urea treatment has also been reported by Doulberg *et al*., (1981) for wheat straw in sheep. Finally, Ali *et al*., (2009), reported ammonia treatment of corn stover was more effective in enhancing the dry matter intake by sheep than those fed urea or poultry litter-treated diets.

CONCLUSION

In conclusion, urea treatment of maize stover was more effective in enhancing the dry matter intake by N'dama calves than those fed untreated maize stovers.

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