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Utilization of Alkali Treated Sorghum Stover Supplemented with Poultry Litter for Growing Heifers in the North East Region of Nigeria

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Abstract: This study was carried out to study the effect of alkali treatment of sorghum stover supplemented with or without poultry litter on feed and live body weight change of growing cattle. Twelve Heifers of mixed breed aged between 16 to 22 months with a mean live weight of 110±8.7 kg were randomly allotted to groups (three animals each). Alkali treated Sorghum Stover with no supplementation (T_1), Sorghum Stover with 0.5 kg day^{-1} poultry Litter (T_2) and Untreated stover, with no supplementation (T_3). Treating Stover with alkali or Alkali treated supplementation with Poultry Litter were significantly increase Dry Matter Intake (DMI) being 2.00, 2.56 and 1.56 kg for TSS_1, TSS_2 and TSS_3, respectively. Dry matter digestibility of Alkali treated Stover was significantly higher than the untreated Stover. Supplementation with poultry litter significantly increased Dry matter digestibility compared with unsupplemented, from the result, it can be deduced that daily live body weight with poultry litter can improve the daily live weight gain of growing cattle.

Key words: Stover, supplementation, urea, guinea-savanna, poultry-litter, heifers

INTRODUCTION

Borno State falls within the North Eastern Region of Nigeria. The rainy season starts in late May and ends in early October. This region is the largest pastoral zone in Nigeria (Rims, 1992). The people depends crop and livestock farming for their means of livelihood.

During dry season, the feed resources available for ruminant livestock feeding in this area are mainly crop residue. It is estimated that over 40% of the dry season grazing time is spent by cattle on crop residues (Powel, 1983).

Cereals such as sorghum and maize are the most important cereal crop cultivated in this region. Abundant straws and stovers are generated after the grain harvest. Protein is the most limiting nutrient in crop residues for feeding ruminant livestock during the long dry season.

Treating crop residue with chemicals like alkali (Buckman, 1919) has been shown to be beneficial. Alkali is used for treatment of crop residue. As a non protein-nitrogen compound, it can be used by rumen microbes for protein synthesis (Loosi and McDonald, 1986). It was suggested that poultry litter can be included up to 15% in the diets of ruminants for both maintenance and production without any deleterious effects (Akangbe and Adeleye, 2002).

Therefore, this study is design to investigate the effect of treating sorghum stover with alkali and supplementing with poultry litter.

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MATERIALS AND METHODS

Nine growing cattle of cross breed aged between 16 to 22 months with a mean live weight of 110±8.7 kg were used in this study. The experiment was carried out in the Department of Animal Science, Livestock Teaching and Research Farm. They were dewormed with Banminth F dewormer and confined to individual pens.

A complete randomized block design was used to determine the effect of supplement on the utilization of alkali treated or untreated Stover.

The animals were randomly allotted to three treatment groups. The treatment groups were (T_1) treated Sorghum Stover with no supplementation, (T_2) treated sorghum stover 0.5 kg poultry litter and (T_3) untreated sorghum stover with no poultry litter. The poultry litter was sun dried to minimize the effect of harmful agents. Five percent alkali solution (50 g of alkali dissolved in one litter of water) was sprayed on 1 kg of Stover using a watering cane and then allowed to dry for twenty four hours before feeding. The supplement was offered once daily at 7.00 am after consumption, the basal diet was offered. At 3.00 pm, the basal diet was offered again.

Daily feed intake of supplement and basal diet were recorded. Feed refusal was collected and weighed daily. Live weight gain was determined by weighing the animal at weekly intervals.

Chemical Analysis

The experimental feeds were analysed for dry matter, crude protein, crude fibre and ash according to AOAC (2000) methods.

Statistical Analysis

All the data collected were analysed using completely randomized block design. Duncan's multiple ranges that was used to compare means test were significantly different (Gomez and Gomez, 1987)

RESULTS AND DISCUSSION

Chemical Composition of the Feeds

The chemical composition of the poultry litter used in this study had a crude protein content of 26.3% higher than that of reported by Odhuba *et al*. (1986) but within the range reported by Bhattcharger and Fontenot (1966). The variation of the crude protein contents may be attributed to the composition feeds of the birds consumed and the age of the litter. The crude protein content of the sorghum stover was higher than what is reported by Oji and Mowat (1986) this may be due to the variety of the Sorghum used, stage of harvest and fertilization, these have been shown to have effect on the nutritive value of the sorghum stover (Table 1).

The result of the study (Table 2) showed animals on untreated Sorghum Stover group consumed low Stover than the treated groups. The result agreed with the findings of Reid and Kloptestein (1983)

Table 1: Chemical composition of the experimental feeds

Feeds	Dry matter (g)	Crude protein	Crude fiber	Ash
Poultry litter (DPW)	92.0	26.3	15.0	16.3
Treated sorghum Stover	62.0	14.0	26.0	10.1
Untreated sorghum Stover	87.0	4.1	27.0	9.7
Sorghum offal	79.0	16.0	20.0	4.5

Table 2: Treatment with alkali and level of supplementation with poultry litter on the performance of growing heifer cattle

Alkali treatment	(Treated)		(Untreated)		
Level of poultry litter	0.0	0.5	0.0	SED	Sig. level
Daily stover intake (kg)	1.50^{b}	1.69^{a}	1.10^{c}	0.13	*
Daily dry matter intake (DMI) (kg)	2.00^{b}	2.56a	1.56^{c}	0.50	**
Daily protein intake (g)	570.00^{b}	770.20^{b}	280.90^{b}	3.14	NS
Daily live gain change (DLW) (g)	19.70	69.70	44.00	9.18	NS
Dry matter digestibility (%)	43.16^{b}	48.73^{a}	39.10^{b}	11.57	**

SED = Standard error of difference between two means; abc = Means within same raw having different superscript differs significantly; * = Significant ($p<0.05$); ** = Significant ($p<0.001$); NS = Non Significant

which showed that feeds with low crude protein content are seldom consumed by animals, as there is an inverse relationship between dry matter intake and the crude fibre. The stover used is of low crude protein content as this may be the reason of low dry matter intake recorded for treatment groups treating sorghum with alkali increased dry matter intake. This is in line with the findings of Iyayi (1991).

Treating the stover with alkali resulted in an increased crude protein content of the sorghum stover. The increase in the crude protein content was 4 times higher than the untreated. This is consistent with the findings of Doyle *et al*. (1986) for sorghum stover. Ensiling crop residue with alkali helps in the dissolution of acid and neural detergent fibre content of the crop residue. Differences in chemical composition may be due to the variety and the composition if the maize stove. Supplement with poultry litter had the benefit of supplying the much-needed ammonia in the rumen through the breaking of the uric acid contained in it. The poultry litter in alkali treated group increases the dry matter intake; this is due to increase in the protein intake which stimulates the rumen microbes. The rumen microbes that digest fibrous materials require nutrients especially ammonia which can be supplied through alkali supplemented feeding.

Supplementation with poultry litter increased the digestibility of alkali treated and untreated stover. The low level, in the live weight of animals offered untreated and unsupplemented Stover treated group, was due to the low protein intake when compared with the other treated groups, hence resulting in low dry matter intake and low dry matter digestibility of the stover, this is consistent with, Walker (1994) who reported that, animals offered crop residue as their sole diet show low dry matter intake and decline in live weight. Treating the stover alone with alkali was able to maintain Live weight of the animals in that treatment group. Leng *et al*. (1977) reported in their study that supply of alkali continuously to animals on basal diet based on poor quality crop residue has effect on increasing intake of the feed but seldom led to growth above maintenance. Also treatment of low quality forages has shown to maintain acceptable level of performance of cows (Farmer *et al*., 2002; Bohnert *et al*., 2002b). Poultry litter has been shown to stimulate growth rate in young cattle when added to feed apparently adequate in fermentable nitrogen (Mayreles and Preston, 1992). Poultry litter supplies minerals, ammonia, co-factors and vitamins required by the rumen microbes and increasing the levels of supplementation in the animal's rations also increased rate of gain.

CONCLUSION AND RECOMMENDATION

From this study, it can be deduced that, feeding of stover alone cannot maintain ruminant livestock. Animals on treatment groups offered untreated stover showed low dry matter intake and dry matter digestibility as a result the animals lost weight. Treatment of stover with alkali at 5% increased feed intake and digestibility of stover's; the animals in this treatment group were able to maintain their body weight. Supplementation with poultry litter in alkali treated groups resulted in an increase in dry matter intake and dry matter digestibility of the stover and improvement of live weight change. Finally, feeding of poultry litter as a supplement to growing cattle consuming stover can be more economical due to low cost of the poultry litter.

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