EVALUATION OF MAIZE COB TREATED WITH DIFFERENT NON-PROTEIN NITROGEN SOURCES AND SOYABEAN MEAL ON PERFORMANCE OF GROWING YANKASA RAMS

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ABSTRACT

In the study the performance of growing Yankasa rams fed maize cob treated with different non-protein nitrogen sources and Soybean meal was investigated. Maize cobs were collected from Dawakin Bassa in Birnin Gwari LGA of Kaduna State. Deep litter poultry manure was used, inorganic granulated urea and soybean were obtained from Kasuwan Gwari local Market in Birnin Gwari. Maize cobs were ground using maize threshing machine of 5cm and below size, poultry litter was sundried for 5 days at 8 hours per day to prevent fermentation. Three hundred kilograms of each of the experimental treatments was produced for the feeding trial. The materials were ensiled for 21 days in proportion and polythene was used to further seal the silo after filling to allow air tight medium for adequate fermentation. Twenty-four Yankasa rams weighing between 11 ± 02 kg) and aged between 5 to 8 months were used for the study *The experimental design was a Complete Randomizes Design (CRD)The study revealed that dry matter values and crude protein (94.65%) in poultry ensiled to (97.53%) poultry unensiled ranged from (6.56%) in urea ensiled to (13.17%) in poultry litter unensiled respectively. The result also revealed average daily weight gain (84.72g) in poultry litter ensiled maize cob was significantly (P<0.05) higher than (65.27g to 66.67g) in unensiled urea, ensiled soybean meal and unensiled poultry litter. In conclusion, treatments of maize cobs with different non protein nitrogen sources and soybean meal increased crude protein content and decreased the crude fibre fractions. Also, treatment of maize cob improved the performance of growing Yankasa rams. It was recommended, that urea, poultry litter and soybean meal could be used to improve the quality of maize cob to alleviate dry season fed shortage and cost of feeding small ruminants.*

Keywords: Ensiled and Unensiled Maize Cob, Soybean Meal, Granulated Urea, Ground Maize Cob

1.0 INTRODUCTION

In the tropics feed resources for livestock are mainly from rangeland complemented with crop residue. Crop residues which are post-harvest materials or roughages left after the removal of the primary feed (grain) from crop plants constitute an important feed for ruminants during the long dry season.(Ocheja *et al*., 2020) Finangwai *et a*l (2010) reported that crop residues are generally low in protein and high in cellulose contents, hence low voluntary intake and digestibility. In Nigeria cereal residues such as sorghum, maize, millet stovers and rice straw are the most important feed for ruminants. The need to use crop residues to complement the dry season feed

shortages have been predicated on the fact that conventional feed has become expensive due to their competitive use by man and industry (Ocheja *et al* 2023;Olorunsomo *et al*.,2010;Sirajo *et al*., 2010; Onwuka, 1997; Tesfaye *et al*., 2006). .Amongst the cereal crop residues, maize cob is the most abundant underutilized and has the greatest potential as a basal feedstuff for small ruminants in the savannah. However, the major limiting factors in the utilization of these crop residues is its cellulosic fibers and low protein contents consequently low digestibility and relatively poor nutrient composition (Ocheja *et al*., 2020)Al-maadhidi and AL-khatib, 2010). The chemical composition of maize cob is as follows: 96.0%, 4.6%, 40.6%, 76.1%, 49.9%, 1.1% and 1.2% for dry matter, crude protein, crude fibre, neutral detergent fibre, acid detergent fibre, ether extract and ash respectively (Aregheore, 1996). Therefore, this study was designed to assess the performance of growing Yankasa Rams fed Maize cob treated with different non-protein sources.

2.0 MATERIALS AND METHODS

2.1 Study Location

The experiment was carried out in Kaduna Sate Veterinary Department in Birnin Gwari, Birnin Gwari Local Goverment Area, Kaduna state. The State is located in the Northern Guinea Savanna ecological zone and occupies an area of about 48,473.2 square kilometers with a projected population of 8.9 million (KDBS, 2020). The State has a suitable climate and environmental conditions favourable for cereal crop production and is becoming notable especially for maize production (Ammani *et al.*, 2012).

2.2 Feed preparation, Experimental Animals and Management

Maize cobs were collected from Dawakin Bassa in Birnin Gwari LGA of Kaduna State. Deep litter poultry manure was used, inorganic granulated urea and soybean were obtained from Kasuwan Gwari local Market in Birnin Gwari. Maize cobs were ground using maize threshing machine of 5cm and below size, poultry litter was sundried for 5 days at 8 hours per day to prevent fermentation. Three hundred kilograms of each of the experimental treatments (Table 1) was produced for the feeding trial. The materials were ensiled for 21 days in proportion (Table 1) and polythene was used to further seal the silo after filling to allow air tight medium for adequate fermentation. Twenty-four Yankasa rams weighing between 11 ± 02 kg) and aged between 5 to 8 months were used for the study. The animals were housed individually and treated with Banminth F and prophylactic treatment consisting of ivomectin (Ivomec) at 0.5mL/25kg body weight were injected subcutaneously against parasites, oxytetracycline at 1.0mL/10kg body weight intramuscularly against bacterial infections were given. Each animal was given 300g of supplement and basal diets daily in two allocations in the morning at 8.00 am and at 3.00 pm in the afternoon. The leftover was collected the following morning and weighed before fresh feed was offered. The rams were provided with fresh drinking water in graduated plastic cylinders to determine the quantity of taken. The experiments lasted for 90 days.

Table 1: Proportion of Maize Cob to Non- Protein Nitrogen Sources

	Ingredients				
Treatment	Maize cob	Urea	Poultry Litter	Soybean meal	Status
A1	70	-	-	30	Ensiled
A2	70	-	-	30	Unensiled
B1	100	+	30		Ensiled
B2	70	-	30	-	Unensiled
C1	100	+	-	-	Ensiled
C2	100	+	-	-	Unensiled

25 kg Maize Cob to 1 kg Urea treatment

2.3 Experimental design

The experimental design was a completely randomized design (CRD). The treatment diets were Treatment A1 (ESBM), Treatment B1 (EPL), Treatment C1 (EU), Treatment A2 (USBM), Treatment B2 (UPL), and Treatment C2 (UU).

2.4 Data Collection

Weight gain

Data on feed intake, final body weight and average body weight gain (changes) and feed conversion ratio was recorded. Feed intake (FI) = Fresh feed – left over. Each ram was weighed at the beginning of the experiment and thereafter fortnightly basis using a weighing scale. Weight gain was determined by subtracting weight obtained in two consecutive weeks.

Weight gain = Weight in the current week – Weight in the previous week

Feed conversion ratio.This was calculated from the records of feed intake and weight gain by dividing the feed intake of the rams by the weight gain.

2.5 Chemical Analysis

Experimental diets and feaces were analysed in the Department of Animal Science Laboratory ,Bayero University, Kano for Dry matter (DM), Crude Fibre (CF) crude protein (CP), Ether Extract (EE), Nitrogen free Extract (NFE). The feed samples were ashed by charring in muffle furnace at 500^{o}C for about 3 hours according to AOAC (2005). The Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF) were analyzed according to the procedure of Van Soest *et al.* (1991). Metabolizable energy of the diets was estimated using the method of Pauzenga (1985): Metabolizable energy [(ME) Mekcal/Kg] = 37(%CP) +81.1 (% EE) + 35.5(%NFE) Cellulose = ADF – ADL Hemicellulose = NDF –ADF (Rinne *et al*, 1997). Organic matter (OM) = DM - ASH.

2.6 Statistical Analysis

Data were analysed using a one-way analysis of variance (ANOVA) and treatment means with significant differences were separated using least significant difference (LSD) with the aid of SAS, 2009 Statistical Package Where significant differences between the means are detected. All the differences between the means were considered significant at 5% probability level ($P \leq 0.05$).

3.0 RESULTS AND DISCUSSION

3.1 Proximate Composition and Fibre Fractions Ensiled and Unensiled Maize cobs

In the experimental diet Table ... (Basal and supplement) the mean values of the chemical composition were significantly ($P<0.05$) different in all the parameters except in ether extract. The mean dry matter ranged from 94.65% in treatment B_1 to 97.53% in treatment B_2. The mean crude protein content varied from 6.56% in treatment C_1 to 13.17% in treatment B_2. Also, ash values were 3.62% in treatment C_1 to 6.17% in treatment B_2 and the crude fibre values ranged from 46.00% in treatment B_2 to 32.82% in treatment C_1. Also, mean value nitrogen free extract 54.04% in treatment C_1 to 31.55% in treatment B_2. The mean acid detergent fibre value 46.20% treatment B_2 was significantly ($P<0.05$) higher than 33.90% in treatment A_2. The mean neutral detergent fibre and acid detergent lignin values varied from 76.12% in A to 89.63% in treatment C_2 and 13.78% in B_1 and highest 19.22% in treatment A_1 respectively. The mean cellulose and hemicellulose values ranged from 16.33% in treatment A_2 to 27.47% in treatment B_2 and 39.47% in treatment A_1 to (45.10%) in A_2. Also, mean energy values ranged 2428.58 kcal and 2351.30 kcal in B_2 and A_2 were significantly ($P<0.05$) different than 1859.13 kcal/kg, 2210.83 kcal/kg, 2290.23 kcal/kg and 2326.72 kcal/kg in treatment A_1, B_1 B_2 and C_1 respectively.,, these energy

levels are below the requirements for goats(NRC, 1998) The mean ether extract though similar, but numerically higher values were observed in C_1, B_1 and A_1 and lower in C_2, B_2 and A_1 respectively.

Table l: Proximate Composition and Fibre Fractions of Ensiled and Unensiled Maize Cobs (%) of Basal Diets

TRT	A_1(ESBM)	B_1(EPL)	C_1(EU)	A_2(USBM)	B_2(UPL)	C_2(EU)	LSD	SUPPL.
Dry Matter	95.59^{b}	94.65^{b}	95.28^{b}	95.56^{b}	97.53^{a}	96.96^{a}	1.131	91.93
Crude Protein	9.66^{c}	7.75^{d}	6.56^{e}	10.43^{c}	13.17^{a}	11.48^{b}	0.898	16.36
Ash	5.78^{a}	5.43^{a}	3.62^{b}	5.18^{a}	6.17^{a}	5.46^{a}	1.023	10.21
Crude Fibre	33.57^{cd}	33.56^{d}	32.82^{d}	35.44^{b}	46.00^{a}	38.48^{bc}	1.078	27.59
Ether Extract	3.43	3.27	3.29	3.15	3.11	3.11	0.35	6.46
Nitrogen Free Extract	48.33^{b}	49.99^{b}	54.04^{a}	44.21^{c}	31.55^{d}	45.45^{c}	1.746	43.92
Acid Detergent Fibre	36.66^{c}	40.29^{b}	40.75^{b}	33.90^{d}	46.20^{a}	44.86^{a}	1.674	37.44
Neutral Detergent Fibre	76.12^{c}	81.75^{b}	82.91^{b}	81.67^{b}	87.99^{a}	89.63^{a}	4.819	48.39
Acid Detergent Lignin	19.22^{a}	13.75^{b}	16.36^{ab}	17.57^{ab}	18.47^{a}	17.99^{a}	4.529	7.27
Cellulose	17.44^{b}	26.55^{a}	24.40^{a}	16.33^{b}	27.73^{a}	27.54^{a}	4.518	30.19
Hemicellulose	39.47^{b}	41.46^{ab}	42.15^{ab}	45.10^{a}	41.79^{ab}	44.77^{a}	4.509	10.37
Energy.	2351.30^{b}	2326.72^{b}	2428.58^{a}	2210.83^{c}	1859.13^{d}	2290.23^{a}	69.123	2590.47

a,b,c,d,e Means with different superscripts within the same row are significantly different (P<0.05)

SUPPL: Supplementary diet
DM=Dry matter, CP=Crude Protein, ASH=Ash, EE= Ether Extract, CF= Crude Fibre, NFE= Nitrogen Free Extract, ADF= Acid Detergent Fibre, NDF=Neutral Detergent Fibre, ADL=Acid Detergent Lignin, CELL=Cellulose, HEM = Hemi cellulose, ENERGY= Energy

3.2 Growth performance of growing Yankasa Rams fed experimental diets

Performance parameters of Yankasa Rams fed ensiled and unensiled maize cob treated with urea, poultry litter and soybean basal diet is summarized in Table 3 There were significant ($P<0.05$) differences in all the parameters evaluated. Final and average daily weight gain values (19.38 kg, 84.72 g/day) in treatment B_1 were significantly ($P<0.05$) higher than (17.55 Kg, 65.28g/day and 17.50 Kg, 65.27g/day) in treatments A_2 and C_2 respectively. Feed to gain ratio was 7.49 in treatment B_1 and 10.79 in treatment C_1. The nutrients intake of the Yankasa ram lamb parameters evaluated were significantly ($P<0.05$) different except for ether extract intake. All the experimental animals fed ensiled or unesiled maize cob treated with urea, poultry litter and soybean meal based diets gained weight. The average daily weight gain was higher in animals fed poultry litter ensiled maize cob diet. The average daily gain in this study was similar to reports by (Sirajo *et al.*, 2010; Ashiru, 2015). This indicates quality improvement of non protein nitrogen sources used in the feeding ruminants for improved performance of animals . The average daily gain recorded is in agreement with (Ashiru 2014) although it is higher than Ibhaze *et. al.* (2015) who reported 29.00g/day to 38.44g/day when WAD were fed naturally fermented maize cob based diets, but lower than 18.3g/day reported by Hamad *et al.* (2011) when urea treated corn - cobs was offered as a replacement of concentrate.

Table 3: Growth performance of growing Yankasa Rams fed experimental diets

Parameters	A_1(ESBM)	B_1(EPL)	C_1(EU)	A_2(USBM)	B_2(UPL)	C_2(UU)	LSD
Initial Weight (kg)	11.63	11.75	11.88	11.88	11.38	11.63	2.047
Final Weight(kg)	18.50^{ab}	19.38^{a}	17.88^{ab}	17.55^{b}	18.63ab	17.50^{b}	1.856
Water Intake(litre)	2.31^{a}	2.23^{ab}	2.26^{ab}	2.08^{c}	2.25^{ab}	2.19^{b}	0.076
Total Weight Gain(kg)	6.875^{abc}	7.63^{a}	6.00^{bc}	5.67^{c}	7.25^{ab}	5.87^{c}	1.305
Average Daily Gain(g)	76.33^{abc}	84.72^{a}	66.67^{bc}	65.28^{c}	80.56^{ab}	65.27^{c}	14.495
Concentrate Intake(g)	298.62^{a}	297.93^{ab}	298.79^{a}	296.82^{b}	298.58^{a}	298.43^{a}	1.371
Basal Diet Intake(g)	290.77^{c}	334.27^{a}	311.59^{b}	295.81^{c}	292.30^{c}	296.74^{c}	9.198
Total DMI	589.39	632.2	610.38	592.63	590.88	595.17	22.40
Feed: Gain	7.71^{bc}	7.49^{c}	10.79^{a}	9.89^{ab}	7.37^{c}	9.14^{ab}	2.128

a,b,c Means with different superscripts within the same row are significantly different ($P<0.05$)

4.2 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Based on the results of this study;

It is concluded that using maize cob treated with poultry litter, urea and soybean meal ensiled and Unensiled enhance crude protein content and reduction of fibre fractions of maize cob. Also improvement of the general performance of growing Yankasa rams was achieved. Poultry litter ensiled maize cob treatment had the best performance.

4.2Recommendations.

Maize cobs can be ensiled with poultry litter and fed to Yankasa rams for improved performance.

Further research can try other materials for ensiling maize cobs

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