NUTRIENT INTAKE AND DIGESTUBILITY OF GROWING YANKASA RAMS FED DIFFERENT LEVELS OF POUTRY LITTER ENSILLED MAIZE COB

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Abstract
In the study the Nutrient intake , drymatter and Nutrient digestibility of growing Yankasa rams fed maize cob treated with different non-protein nitrogen sources and Soybean meal in were 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, and poultry litter was sundried for 5 days at 8 hours per day to prevent fermentation. Three hundred kilograms of each of the experimental diets 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 Randomized Design (CRD)he 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.All the nutrient intake values were significantly(P<0.05) improved, Nearly all the digestibility values were significantly better with ensiling 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,, thus enhancing nutrient intake and digestibility, It was recommended, that urea, poultry litter and soybean meal could be used to improve the quality of maize cob fed to small runinants to enhance nutrient intake and digestibility.*

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

Introduction

Feed shortages and high cost of feeds have been reported by many researchers (Ocheja *et al*, 2020, Ocheja *et al*, 2018, Sirajo *et al*, 2010) 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 products from whole grains and tubers , this constitute an important feed for ruminants during the long dry season. 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* 2020; ; Sirajo *et al*., 2010). .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 (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 Nutrient Intake

The nutrient intake were calculated from the feed intake records and the proximate composition of the experimental diets

2.5 Digestibility Trial

The nutrient digestibility study was conducted using three animals from each treatment. The animals were fed the same experimental diets in the feeding trial. The digestibility trial lasted for 14 days, in which seven days were used for adaptation. The experimental animals were fitted with harness bags, and 7 days were used for feacal sample collection. During the collection period, daily feed intake and total faecal output from each animal were recorded. After thorough mixing, 5% of the representative faecal sample was oven dried at 60^{o}C for dry matter determination and stored for proximate analysis and the values obtained were thereafter used to compute the nutrient digestibility using the formular

2.6 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.

2.7 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 were 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

Proximate Composition and Fiber Fractions of Maize Cob Ensiled and Unensiled

In the experimental diet Table 2 (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 metabolizable energy values are lower than the requirement for goats(Ocheja *et al.*, 2023; Ocheja 2020;NRC, 1998)The mean ether extract though significantly (P>0.05) 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:2 Proximate Composition and Fibre Fractions (%) 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

Nutrients intake (g/day) of Yankasa Sheep Fed Diet for the Fattening Using Poultry Litter Ensiled Maize Cob at Graded Levels of Inclusion

Nutrients intake (g/day) Table 3: of Yankasa sheep fed graded level (0%, 10%, 20% and 30%) of poultry litter ensiled maize cob based diet all the values of nutrients intake were significantly (P<0.05) affected. The Dry matter intake values were significantly (P<0.05) higher in treatment A than in treatment B, C and D but dry matter intake showed a decreasing pattern with the increase level of poultry litter ensiled maize cob inclusion . The mean values of nitrogen free extract (353.40g/day) intakes were significantly (P<0.05) higher and (330.65 g/day) int akes in treatment D though not significantly (P>0.05) with 336.61% in treatment A and 337.48g in treatment C. The mean acid detergent lignin intake value though significant (P<0.05) different (77.11 g/day in treatment D than (68.78 g/day) > (56.52 g/day) > (55.78) in treatment C, B, and A respectively. Therefore, mean value Lignin intake increases with the increasing level of inclusion of

poultry litter ensiled maize cob. The mean hemicellulose intake (114.65) in treatment C was significantly (P<0.05) higher than (107.77 g/day), (101.00 g/day) and (93.90 g/day) in treatment B, D and A respectively The high nutrient intake in the present study was similar to Wanapat, *et al* (2009) when Rice straw treated with non protein nitrogen sources was supplemented. The high nutrients intake could be associated with treatment and supplementation (Ali, Fontenot and Allen, 2009). The nutrients intake was positively correlated to dry matter intake and the mean crude protein 6.65% to 13.17% content were within values reported for effective rumen function 6 to 8% recommended for ruminants in the tropics NRC (1998). Similarly the crude protein 13.30% to 13.36% in the present study is similar to 10.9% to 12.7% recommended for fattening ruminants (Aduku, 2005 and Gate by, 2012) thereby making the crude protein sufficient for maitainance and production but lower than 16.15% to 16.25% reported by Garba and Saulawa (2012) in diet containing rice milling waste and soybean residue fed to Yankasa ram lamb.

Table 3: Nutrients intake (g/day) of Yankasa Sheep Fed Poultry Litter Ensiled Maize Cob at Graded Levels of Inclusion (%).

Parameters	0(A)	10(B)	20(C)	30(D)	LSD
DM	704.46^{a}	652.81^{b}	626.82^{bc}	621.50^{c}	33.878
CP	102.29^{a}	93.54^{b}	97.49^{b}	87.13^{c}	4.884
ASH	78.23^{a}	69.56^{b}	70.35^{b}	63.17^{c}	3.636
EE	29.04^{b}	30.64^{a}	24.27^{c}	21.16^{d}	1.414
CF	211.41^{a}	205.05^{ab}	205.30^{ab}	195.23^{b}	10.343
NFE	336.61^{ab}	353.30^{a}	337.48^{ab}	330.65^{b}	17.351
NDF	370.78^{ab}	361.88^{bc}	380.56^{a}	350.04^{c}	18.595
ADF	286.88^{a}	254.11^{bc}	266.61^{b}	249.02^{c}	13.507
ADL	55.78^{c}	56.52^{c}	68.78^{b}	77.11^{a}	3.133
Cellulose	231.23^{a}	197.54^{b}	197.81^{b}	171.93^{c}	10.426
Hemicellulose	83.90^{d}	107.77^{b}	114.65^{a}	101.00^{c}	5.139

a, b,c.d Mean with different superscripts within the same row are significantly different (P<0.05)DMI=Dry matter Intake, CPI=Crude Protein Intake, ASHI=Ash Intake, EEI= Ether Extract Intake, CFI= Crude Fibre Intake, NFEI= Nitrogen Free Extract Intake, ADFI= Acid Detergent Fibre Intake, NDFI=Neutral Detergent Fibre Intake, ADLI=Acid Detergent Lignin Intake, CELLULOSE Intake =Cellulose Intake, HEMICELL Intake = Hemi cellulose Intake, ENERGYI= Energy Intake

Dry Matter and Nutrients Digestibility (%) of Yankasa Sheep Fed Poultry Litter Ensiled Maize Cob at Graded Levels of Inclusion.

Nutrients digestibility(Table 3) of Yankasa sheep fed ensiled maize cob - poultry litter based diets at 0% (A), 10%(B), 20%(C) and 30%(D) levels of inclusion. The digestibilties parameters evaluated were significantly (P<0.05) different in dry matter, crude protein, ash acid detergent fibre, cellulose and energy digestibility. The mean values of dry matter digestibility 64.31% in treatment A was significantly (P<0.05) higher than 60.18% in treatment D to. The crude protein digestibility were significant (P<0.05) higher (68.36%) in treatment A than (63.85%) in treatment D. Also, the mean crude fibre digestibility were significantly (P>0.05) similar but decreasing pattern was observed 67.66%> 66.69 %< 66.22 %< 64.29% A, B, C and D respectively and mean energy values were significantly (P<0.05) different and the pattern was also decreasing 66.13% < 64.34% < 63.75% < 62.29% in treatment A, B, C and D respectively. Furthermore, the mean ash value digestibility were significant (P<0.05) different with 54.58% in treatment A than (36.28%) in treatment D. Whereas, ether extract, nitrogen free extract, crude fibre, neutral detergent fibre, acid detergent lignin and hemicellulose were significantly (P>0.05) similar and decrease pattern was observed in all the parameters with the increasing level of ensiled maize cob - poultry litter. The digestibility of all the nutrients evaluated in this study might be attributed to increased palatability, crude protein and the subsequent reduction of the fibre fraction as a result of treatment with non protein nitrogen sources. The digestibility of all the nutrients recorded were high (Ocheja *et al* 2018) and this improvement is in line with the study of Adebowale *et al.* (2013), Fajemisin *et al*. (2013) for West African Dwarf goat fed treated

maize cob silage but higher than Javid *et al*. (2015) in the replacement of wheat straw with maize cob in *In-vitro* using goat rumen liquor and Ibhaze and Fajemisin (2015) when West African Dwarf goat were fed naturally farmented maize cob based diets. On the other hand the values were lower than the report of Ajayi,*et al* (2016) for West African Dwarf goat fed Corn cob- poultry dropping silage.

Table 4: Dry Matter and Nutrients Digestibility (%) of Yankasa Sheep Fed Diet for the Fattening Using Poultry Litter Ensiled Maize Cob at Graded Levels of Inclusion.

Parameters	A	B	C	D	LSD
DM	64.13^{a}	66.42^{a}	64.19^{a}	58.54^{b}	1.7
CP	65.26^{a}	69.64^{a}	68.29^{a}	55.23^{b}	6.3
EE	76.12	62.66	61.30	49.66	3.45
ASH	54.58^{a}	47.27^{ab}	43.29^{ab}	36.28^{b}	13.61
CF	65.37	67.48	66.29	62.61	7.05
NFE	64.50^{ab}	56.62^{c}	66.66^{a}	60.72^{bc}	5.09
NDF	67.35^{a}	54.94^{b}	68.14^{a}	60.92^{bc}	5.2
ADF	65.32^{a}	61.03^{c}	65.08^{ab}	62.09^{bc}	3.6
ADL	57.41	56.68	59.07	66.23	17.37
CELL	66.69	68.84	67.69	63.98	7.41
HEM	57.77	63.18	61.83	56.69	25.16
ENERGY	65.28^{a}	68.06^{a}	66.89^{a}	58.85^{b}	4.11

a,b,c Mean with different superscripts within the same row are significantly different (P<0.05)DMD=Dry matter Digestibility, CPD=Crude Protein Digestibility, ASHD=Ash Digestibility, EED= Ether Extract Digestibility, CFD= Crude Fibre Digestibility, NFED= Nitrogen Free Extract Digestibility, ADFD= Acid Detergent Fibre Digestibility, NDFD=Neutral Detergent Fibre Digestibility, ADLD=Acid Detergent Lignin Digestibility, CELLULOSED=Cellulose Digestibility, HEMICELLD= Hemi cellulose Digestibility, ENERD=)

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, there by leading to enhanced nutrient intake and digestibility.

Recommendations.

Maize cobs can be ensiled with poultry litter and fed to Yankasa rams for enhanced nutrient intake and digestibility.

Further research can try other materials for ensiling maize cobs

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