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Growth Response of West African Dwarf Goats Fed differently treated Corncob Silage Diets

***Adebowale Noah Fajemisin[1], Oluwatosin Bode Omotoso[1], J.Oluwasola Agbede[1] and Olufemi P.A. Olowu[2].**

[1]Federal University of Technology, Department of Animal Production and Health, Akure, Nigeria.
[2]Federal College of Agriculture, Department of Animal Production, Akure, Nigeria.
*debofajemisin@yahoo.co.uk and/or +2348033746415

Introduction

"Agricultural waste" is increasingly being viewed as a valuable resource though they are usually fibrous, with poor quality nutrients which make their digestibility low. In Nigeria there are more than 21 million tonnes of plant by-products produced annually, among them is the corn crop residues which include; green corn, corn Stover, corn stalk and corncobs (Fajemisin *et al.,* 2012). Biochemically treated corncob silage meal is a high-quality feed that contains a high concentration of energy, protein and some mineral elements. Silage can be an economical source of nutrients for sheep and goats, especially on large farms where feeding can be mechanized (Susan, 2009). The use of urea or ammonia, lye solution and poultry litter to upgrade the nutritive value of straws and other low quality crop residues have been world wide spread in the last three decades (Chineke *et al.,* 2013). Urea and poultry litter are the most commonly used. Inexpensive non-protein nitrogen (NPN) is alternative source and attractive protein replacement compared with nowadays tremendously expensive natural proteins. Using lye solution, urea and poultry litter to upgrade the nutritive value of corncobs could help to enhance the use of corncobs as protein rich resources for small ruminants during dry season and feed scarcity. Also, using corncobs in animal feeding would help in reducing environmental pollution from burnt corncobs. Hence, this study was conducted to evaluate the growth response and utilization of corncobs ensiled with urea, lye or poultry litter in feeding West African Dwarf (WAD) goats.

Material and Methods

The experiment was carried out at the small ruminant unit of the Teaching and Research the (T&R) farm of the Federal University of Technology, Akure, Ondo State, Nigeria. Five hundred (500) kilogram of sun-dried corncobs used was collected at crop processing unit of T&R, crushed to 2 cm particle size and divided into 5 equal portions, the 1st portion was untreated, 2nd portion was treated with water (1ltre water/ 1 kg corncobs), 3rd portion was treated with lye solution (1 litre lye solution/1 kg corncobs), 4th portion was treated with poultry litter (1 kg poultry litter / 1 kg corncobs) and the 5th portion was treated with 5% urea solution (1 litre urea solution / 1 kg corncobs) and each ensiled in 400 litres capacity plastic drums under anaerobic condition for 28 days. Five diets were formulated such that each air-dried ensiled product was incorporated at 45% level into the diets respectively (Table 1).

Thirty (30) West African Dwarf (WAD) goats used for the study were sourced among the flock at the T&R, treated against endo-parasite and ecto-parasite with ivometin® and injectible oxytetracycline® at the rate of 1ml to 10kg body weight. The animals were assigned to the 5 diets (six goats/diet) in a completely randomized design for a period of 63 days. They were housed in the individual pens and allowed them two weeks to adapt to their feeds and new environment. The animals were fed two times daily (8:00 am and 4:00 pm), the daily feed intake by the animals was determined by subtracting the weight of the feed refused from the offered and they were weighed on weekly basis to monitor the body weight change. The animals were transferred to the metabolic cage during the last 14 days of the study period to collect faecal and urine samples. Ten percent of the feacal samples were taken and oven-dried at 65^0C for three days for moisture content determination. Volatilization of nitrogen from urine was prevented by introducing 5ml of 10% H_2SO_4 into the urine sample bottles. The samples of feed, faeces and urine were analyzed for chemical components according to the methods of (AOAC, 2002) and all data collected were analyzed using SAS/SPSS 17 (2008) package.

Table 1: Percentage composition of corncob silage diets fed to West African Dwarf goats

Ingredients (%)			**Diets**		
	A	**B**	**C**	**D**	**E**
Corncob	45.00	45.00	45.00	45.00	45.00
Palm kernel cake	30.00	30.00	30.00	30.00	30.00
Rice husk	23.60	23.60	23.60	23.60	23.60
Bone meal	0.60	0.60	0.60	0.60	0.60
Salt	0.50	0.50	0.50	0.50	0.50
Premix	0.30	0.30	0.30	0.30	0.30
Total	100	100	100	100	100

A= Untreated corncobs, B= Water treated corncobs**,** C=Lye treated corncobs, D=Poultry litter treated corncobs, E=Urea treated corncob

Results and Discussion

The chemical compositions (Table 2) of the five diets were significantly ($p<0.05$) influenced by the treatments with the exception of dry matter, ether extract, ash and acid detergent fibre. The dry matter (DM) values of the diets ranged from 84.48 % (diet D) to 88.06% (diet A).The poultry litter treated corncob silage diet (diet D) had the highest crude protein value (30.96 %) while untreated corncob silage diet (diet A) had the least (12.54%) value; this observation agreed with the report of Oji *et al.* (2007) that the use of non-protein nitrogen such as urea and or uric acid to improve the nutritional value of low quality crop residues is still considered as the most favourable. Crude fibre (CF) content of water treated corncob silage diet (diet B) was the highest (38 45%).

Table 2: Chemical composition of corncob silage diets fed to West African Dwarf goats

Parameters (%)			**Diets**			
	A	**B**	**C**	**D**	**E**	**SEM**
Dry Matter	88.06	85.37	84.79	84.48	84.65	0.79
Crude Protein	12.54^d	15.27^c	16.03^c	30.96^a	25.11^b	1.87
Crude Fibre	36.16^a	38.45^a	28.19^b	18.61^c	26.63^b	2.03
Ether Extract	6.06	6.23	5.53	5.89	6.28	0.25
Ash	7.24	6.53	6.83	6.36	6.02	0.20
Nitrogen Free Extract	38.00^b	33.67^c	43.42^a	38.18^b	44.51^a	1.15
Neutral Detergent Fibre	71.28^a	67.98^b	61.40^c	60.40^c	60.65^c	1.21
Acid Detergent Fibre	46.84	46.01	45.14	44.84	43.14	0.68
Calcium	1.79^c	2.49^{bc}	3.55^{ab}	4.54^a	1.68^c	0.32
Magnesium	0.29^d	0.45^c	0.87^b	1.76^a	0.82^b	0.14

abcd = Means with the same superscript in a row have no significance difference ($P > 0.05$). A= Untreated corncobs, B= Water treated corncobs**,** C=Lye treated corncobs, D=Poultry litter treated corncobs, E=Urea treated corncobs

The decreased Neutral detergent fibre (NDF) and Acid detergent fibre (ADF) contents with the increased protein values of the diets may be attributed to delignification of lignocelluloses complex of corncobs during ensiling (Schneider,1995). The nutrients intake, digestibility coefficients, nitrogen retention, minerals balance, weight gain and feed/gain ratio values (Table 3) were significantly ($p<0.05$) influenced by the inclusion of ensiled corncob meals in the diets. The results revealed that animals fed urea treated corncob silage diet (diet E) had better DM, CP, NDF and ADF intake and digestibility values compared with animals fed other diets. This observation was supported by the report of Fajemisin *et al.* (2012) that low dietary fibre fractions and adequate protein content in livestock diets enhanced nutrients intake and digestibility. The animals fed diets D and E have weight gain values of 35.55 and 38.79g/day respectively compared to 11.57g/day observed in animals fed diet A. The weight gain per day recorded for animals fed diets D and E fell within 28.75-55.20g/day reported by Alli – Balogun *et al.* (2003) for sheep fed cassava foliage as protein supplement. The animals fed diets D and E converted their feed to flesh better than animals fed other diets however, the best feed/gain ratio (8.48) was observed in animals fed diet D indicating the ability of poultry litters as a better ensiling material than water, urea and lye**.**

Table 3: Performance characteristics of West African Dwarf goats fed corncob silage diets

Parameters	**Diets**					**SEM**
	A	**B**	**C**	**D**	**E**	
Nutrients intake (g/day)						
Dry matter	270.44^{c}	210.25^{d}	304.01^{b}	301.44^{b}	376.83^{a}	14.60
Crude protein	33.91^{c}	32.09^{c}	48.73^{b}	93.33^{a}	94.62^{a}	7.46
Neutral detergent fibre	192.77^{b}	142.93^{c}	186.66^{b}	182.07^{b}	228.55^{a}	7.41
Acid detergent fibre	126.67^{b}	96.74^{c}	137.23^{b}	135.17^{b}	162.56^{a}	5.92
Calcium	4.84^{d}	5.24^{d}	10.79^{b}	13.69^{a}	6.33^{c}	0.93
Magnesium	0.78^{c}	0.95^{c}	2.64^{b}	5.31^{a}	3.09^{b}	0.45
Digestibility coefficient (%)						
Dry matter	58.75^{c}	58.41^{c}	65.86^{b}	64.05^{b}	80.26^{a}	2.21
Crude protein	64.07^{b}	64.26^{b}	64.71^{b}	70.96^{a}	71.64^{a}	0.96
Neutral detergent fibre	58.10^{c}	66.43^{b}	60.94^{c}	66.70^{b}	73.30^{a}	1.47
Acid detergent fibre	51.91^{e}	66.00^{c}	61.18^{d}	73.43^{b}	78.54^{a}	2.51
Nutrients utilization						
Nitrogen retention (g/day)	4.34^{d}	4.63^{d}	5.68^{c}	9.75^{a}	7.92^{b}	0.56
Calcium	1.91^{d}	2.14^{cd}	3.16^{b}	4.21^{a}	2.80^{bc}	0.24
Magnesium	0.46^{c}	0.61^{c}	1.69^{b}	2.38^{a}	1.32^{b}	0.20
Initial liveweight (kg)	14.65^{a}	14.65^{a}	14.64^{a}	14.65^{a}	14.65^{a}	0.34
Final liveweight (kg)	15.38^{b}	15.40^{b}	15.37^{b}	16.89^{ab}	17.09^{a}	0.28
Weight gain (g/day)	11.57^{c}	11.90^{c}	11.59^{c}	35.55^{b}	38.79^{a}	3.35
Feed/gain ratio	23.37^{b}	17.67^{c}	26.23^{a}	8.48^{e}	9.71^{d}	1.90

abcde = Means with the same superscript in a row have no significance difference ($P > 0.05$). A= Untreated corncobs, B= Water treated corncobs**,** C=Lye treated corncobs, D=Poultry litter treated corncobs, E=Urea treated corncobs

Conclusions and Outlook

The results of this study revealed that urea treated corncobs enhanced better weight gain than other test diets while goats fed poultry litter treated corncob diet had better feed/gain ratio than the other test diets. Thus, the use of urea and/or poultry litter treated corncobs in goat diets could lead to enhanced goat production in sub-Sahara Africa.

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