

Acceptability and digestibility of ensiled mixtures of corncobs, cassava peels and brewers' grain by West African Dwarf goats

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Abstract

A total of twelve West African Dwarf goats of an average liveweight of 9.5 ± 0.5 kg *in a completely randomized design were allocated to three dietary treatments to determine the intake, acceptability and digestibility of ensiled mixtures of corncobs (CC), cassava peels (CSP) and brewers' grain (WBG). The ensiled dietary treatments were: CC/CSP, CC/WBG and CC/CSP/WB. The goats were offered the diets in a cafeteria system for the evaluation of their preferences. The Results show that the combination of corncobs with brewers' grain recorded the highest crude protein (22.06%) and least crude fibre (18.11%) values. Although, the Coefficient of Preference (CoP) was not up to unity, the highest acceptability value (0.93) was obtained for CC/CSP/WB. Significant differences were observed in dry matter intake among the treatments with goat fed diet CC/WBG having the highest value (247.49g/hd/d). Dry matter and neutral detergent fibre digestibilities were significantly ($p<0.05$) different among the treatments. However, no significant difference ($p>0.05$) was observed in crude protein digestibility values. The results of this study showed that ensiling CC with CSP or WBG or with the combination of CSP and WBG can enhance the utilization of corncobs as feed for goat.*

.**Key Words:** silage, acceptability, intake, digestibility, West African Dwarf goats

Introduction

Providing a balanced ration for the animals is the aim of every livestock keeper (Ibhaze *et al.,* 2014). Scarcity and poor quality of grasses especially during the dry periods constitute a major constraint to the productivity of ruminants in sub-Saharan Africa. However, the effects of this can be mitigated by the use of crop residues and agro-industrial by products which are abundant at harvest periods. In Nigeria, large quantities of agro-industrial by-products are produced and many of them have potentials as non-conventional feedstuffs (Adeniji and Ehimere, 2003). Such by-products include corncobs, cassava peels and brewers' grain. Corncobs are usually discarded after removing the grains, but in recent times, they are used as fuel thereby causing environmental pollution. Alternative uses of corncobs for ruminant feeding can reduce its level of environmental pollution. Although, corncobs and cassava peels have low protein and poor digestibility, their nutritional values can be improved with protein sources in order to enhance their utilization in ruminant feeding (Adegbola, 2002).

Goats are known to be selective in their feeding habit, and the process of selecting their diets is influenced by factors such as

plant physical structure and the chemical composition (Provenza and Cincotta, 1994). This study was therefore carried out to evaluate the feeding value of corncobs ensiled with cassava peels and brewers'grain. The objectives of this study are: (1) To determine the acceptability of ensiled mixtures of corncobs, cassava peels and brewers' grain (2) To determine the intake and digestibility of ensiled mixtures corncobs, cassava peels and brewers'grain by West African Dwarf goats

Materials and Methods

The study was carried out at the Dairy Unit of the Teaching and Research Farm of the University of Ibadan, Ibadan, Nigeria. Fresh cassava peels and corncobs were obtained from cassava processing centre and local market in Ibadan and were chopped and crushed and ground respectively using a local chopper. Brewers' grains (WBG) were obtained from a brewery. Twelve female West African Dwarf goats were purchased from the surrounding villages of the University of Ibadan. They were placed on prophylactic treatment and treated against endoparasites and ectoparasites with mean weight of 9.5 ± 0.5 kg were used in a completely randomized design to determine the intake and acceptability of ensiled mixtures of corncobs, cassava peels and brewers' grain. The cafeteria method was adopted in the acceptability study. The experimental diets were offered to animals (4kg each) which were placed in strategic locations in plastic feeding troughs. Goats were allowed to feed for a period of 4 hours daily and for 12 days. Consumption was measured by deduction of remnants from the amount of feed offered, and animals were allowed access to the remnant feed for the rest of the day. The preferred feed was assessed using two indices, the Coefficient of Preference (CoP) and Percentage preference (Pp). CoP was calculated as the ratio of individual diet intake to average intake of all the diets as described by Karbo *et al*. (1993) while Pp was calculated as the ratio of individual intake to total intake multiplied by 100.

For the digestibility study, twelve female West African Dwarf goats were placed in individual metabolic cages provided with facilities for the collection of faeces separately. After a week adjustment period, feed and water were offered *ad libitum* for 7 days. Left –over feed were collected and weighed daily in the last 14 days. Ten percent of faeces collected were taken and oven dried at 65^0C for dry matter determination. The oven dried feed at 105^0C and feacal samples were milled and stored in air tight – containers until required for analysis. Proximate and chemical composition of the feed and faeces were determined by the methods of AOAC (1995) and van Soest and Robertson (1985) respectively. Data obtained were subjected to analysis of variance and significant means were separated by Duncan's multiple range tests using the procedures of SAS (2000).

Results and Discussion

The gross composition of the experimental diets is shown in Table 1. The wet brewers' grain and corncob both act as conditioners; i.e the corncob has the advantage of absorbing the juice from wet brewers' grain and consequently limiting losses during fermentation through effluents while the wet brewer's grain improves the moisture content of corncobs to facilitate compaction during ensiling.

The chemical composition of experimental diets is presented in Table 2. All silages had numerically similar DM content. Although, crude protein content in CC/WBG was

Table 1: Gross composition of experimental diets

	Treatments		
Ingredients	*CC/CSP*	*CC/WBG*	*CC/CSP/WBG*
Corncobs	13.00	13.00	13.00
Cassava peels	80.00	-	40.00
Brewers' grain	-	81.00	41.00
Palm kernel cake	5.00	5.00	5.00
Urea	1.00	-	-
Dicalcium phosphate	0.50	0.50	0.50
Sulphur	0.50	0.50	0.50

CC/CSP (Corncobs/Cassava peels), *CC/WBG* (Corncobs/ Wet brewers' grain), *CC/CSP/WBG* (Corncobs/ Cassava peel/Wet brewers' grain)

slightly higher than other diets, all diets had protein content higher than the minimum of 6-7, 10-12 and 14-18% required in ruminant diets for effective rumen function, minimum protein requirement for ruminants and for lactating goats respectively (Milford and Haydock,1965; NRC,1981; ARC, 1985). The crude fibre obtained would be adequate to meet the fibre requirement of the animals.

Acceptability of the ensiled mixtures by West African Dwarf goats is presented in Table 3. The CoP and Pp of the diets varied significantly ($P<0.05$) across the diets. For all the diets, the CoP (0.72- 0.93) was less than unity, and the overall percentage preference ranged from 12.03 - 15.38. The result further showed that acceptability was highest for diet CC/CSP/WBG with values 0.93 and 15.38 % as CoP and Pp respectively. This could be attributed to the presence of cassava peels and brewers' grain in the mixture as ruminants are used to these feed resources and relish them especially when fermented. This results conforms with the findings of Olorunnisomo (2011) that the addition of cassava peel enhances the acceptability of elephant grass silage among goats and Ikhimioya (2008) that goats more readily

Table 2: Chemical composition of experimental diets

	Treatments		
Component (%)	*CC/CSP*	*CC/WBG*	*CC/CSP/WBG*
Dry matter	35.63	37.43	36.17
Crude protein	16.18	22.06	19.50
Crude fibre	20.97	18.11	22.13
Ether extract	7.11	9.15	8.05
Ash	5.46	5.61	4.92
Nitrogen free extract	52.48	42.21	45.40
Neutral detergent fibre	46.03	39.12	40.15
Acid detergent fibre	29.11	23.03	27.23

CC/CSP (Corncobs/Cassava peels), *CC/WBG* (Corncobs/ Wet brewers' grain), *CC/CSP/WBG* (Corncobs/ Cassava peels /Wet brewers' grain)

Table 3. Acceptability of ensiled mixtures of corncobs, cassava peels and brewers' grain by WAD goats.

	Treatment			
Parameter	*CC/CSP*	*CC/WBG*	*CC/CSP/WBG*	*SEM*
DM (intake g/day)	266.59[b]	299.48[a]	303.95[a]	28.60
COP	0.72[c]	0.83[b]	0.93[a]	0.06
%Preference	12.03[c]	13.73[b]	15.38[a]	1.02
Rank	3[rd]	2[nd]	1[st]	

Means with same superscripts on the same row are not significantly different (P>0.05) *CC/CSP*(Corncobs/Cassavapeels),*CC/WBG*(Corncobs/Wetbrewers'grain), *CC/CSP/WBG* (Corncobs/ Cassava peels /Wet brewers' grain)

accept diets with which they have had previous experience.

The dry matter intake and nutrient digestibility of the test diets are shown in Table 4. Significant variations (P< 0.05) were observed in dry matter intake, crude protein, and neutral detergent digestibility among the treatments. However, goats on treatment CC/WBG had the highest dry matter intake (247.49g/day). This could be attributed to the high level of protein (22.06%) in the diet as high crude protein content in feed stimulates appetite and feed intake (Adebowale and Taiwo, 1999) and provide rumen degradable nitrogen for micro-organisms to build their body protein. Also, the smaller particle size of brewers'grain with the ground corncob did not give room to animals for selection, hence intake was encouraged. Particle size and resistance to fracture are known to affect ease of prehension, mastication, and the rate of passage and intake rate (Inoue *et al.*,1994; Omokanye *et al.* 2001; Lu *et al.*, 2005; Do Thi Thanh Van, 2006).

FAO, (1995) classified digestibility of feed as high (>60%), medium (40-60%) and low (<40%). In this study, medium digestibility of feed was obtained. Dry matter digestibility of the diets obtained ranged from (43.05- 50.04 %) and showed significant variation (P< 0.05) across the

Table 4: Dry matter intake and Nutrient digestibility of ensiled mixtures of corncobs, cassava peels and brewers' grains by WAD goats

	Treatment			
Parameters	*CC/CSP*	*CC/WBG*	*CC/CC/WBG*	*SEM*
DM intake(g/day)	216.15[c]	247.49[a]	223.30[b]	33.31
Digestibility (%)				
DM	43. 05[b]	50.04[a]	48. 75 [a]	3.62
CP	48.71[b]	52.41[ab]	51.30[ab]	6.8
NDF	30.70[b]	38.89[a]	37.05[a]	4.45
ADF	18.58	20.25	19.27	3.76

Means with same superscripts on the same row are not significantly different (P>0.05) *CC/CSP* (Corncobs/Cassava peels), *CC/WBG* (Corncobs/ Wet brewers' grain), *CC/CSP/WBG* (Corncobs/ Cassava peel/Wet brewers' grain)

treatments. However, CC/WBG had the highest value (50.04%). This could be due to the high level of protein and low fibre content in the diet which influenced microbial protein synthesis, facilitated fermentation and consequently improved intake and digestibility. Values obtained in this study are comparable to 54.67-68.0% reported by Olorunnisomo and Dada (2011) for Red Sokoto goats fed cassava peels ensiled with elephant grass, but at variance with 64.48-70.35% obtained by Fasae *et al*. (2012) for goats fed diets based on cassava residues and by-products .

Crude protein digestibility did not follow the same trend as dry matter digestibility as there were no significant variations ($p>0.05$) among the treatments. The higher neutral digestibility value (38.89%) for animals on CC/WBG diet is a reflection of higher protein level in the diet than other diets which encouraged microbial growth and subsequent digestibility of fibre. This result agrees with other findings that increased level of protein in ruminant diets improved the digestibility of such diets (Preston and Leng, 1987; Olorunnisomo and Ososanya, 2002; Ogunwole, 2004).

Conclusion and Recommendation

Results showed that ensiled combination of Corncobs with cassava peels and brewers' grain is relished and had a better acceptability by goats and can be used to sustain ruminants during periods of feed scarcity. However, corncob and brewers' grain combination had a better digestibility. This study has also shown that intensive system of goat management can be practiced using ensiled combinations of corncobs, cassava peels and brewers' grain as feed. For effective utilization of corncobs as ruminant feed, it is therefore recommended that it should be combined with adequate protein source.

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