

Dry matter acceptability and digestibility of nutrient by West African dwarf Rams fed polyenzyme treated cassava peel and corn cob based diets

*Olamilusi, O. D., Olotu, J. D. and Eniolorunda, O. O.

Department of Animal Production, Faculty of Agricultural Production and Renewable



Resource, College of Agricultural Sciences, Olabisi Onabanjo University,

Ayetoro Campus, Ayetoro, Ogun State, Nigeria.

*Corresponding mail: delpoca@gmail.com

Abstract

The study was conducted to evaluate the effect of polyenzyme treated corn cob based diet on the dry matter acceptability and nutrient digestibility by West African dwarf rams. Sixteen (16) rams were used in a completely randomized design, comprising of 4 per treatment in metabolic cages for digestibility while for acceptability each animal was allotted to a pen and the cafeteria feeding method employed. The dietary treatments were: T1 (cassava peel untreated); T2 (corn cob untreated); T3 (polyenzyme treated cassava peel) and T4 (polyenzyme treated corn cob) respectively. The result for dry matter acceptability showed that T3 had the highest value for dry matter intake (979.20g/h/d); coefficient of preference (1.06) and percentage of preference (26.44%). Significant ($p < 0.05$) difference were obtained for the digestibility percentages of all the proximate nutrients. The digestibility values recorded for T3 was the highest ($P < 0.05$) for DM (78.81), CP (81.91), CF (70.24), EE (37.40), NEF (80.05), NDF (76.99) and ADF (71.69). However, it is recorded that inclusions of polyenzyme to cassava peel and corncob have a promising acceptability, enhanced and efficiently utilized by sheep. The study shown that treatment of cassava peels and corn cob with polyenzyme improved and sustain ruminants during period of feeds insufficiency. Also, provide a better utilization of wasteful cassava peel and corn cob to feedstuff so as to improve farmers that practice intensive ruminant management.

Keywords: Dry matter acceptability, digestibility, polyenzyme, cassava peels, corn cob, WAD rams.

Introduction

Livestock especially small ruminants suffer from scarcity in feed supply and pasture quality in the humid region of West Africa, during the dry season when the natural vegetation is of poor nutritive value (Akinfala and Tewe, 2002; Aye, 2007). There has been a search for and interest in the use of unconventional and less expensive feed ingredients to mitigate this scarcity (Odeyinka and Ademosun, 1995). This is basically due to high cost of conventional feeds which is a contributory factor resulting to high cost of livestock production in Nigeria. Cassava peels, corn cobs and brewers' grain are feedstuff that are unconventional and are always discarded or allowed to rotten (Oboh, 2006). However, these results in the loss of

nutritionally valuable materials which when processed and improved with protein sources could yield various valuable products like biofuels, chemicals and cheap energy sources for fermentation, improved animal feeds (Adegbola, 2002). There is tremendous potential of agro-industrial by-products and crop residues in upholding the aims of livestock production (Eniolorunda *et al.*, 2008).

Although the use of cassava peels and corn cob as livestock feed is not so acceptable because of the high toxic level of cyanogenic glycosides and the indigestible nature of corn cob. These limitations can be reduced by supplementing cassava peel based diets with urea to increase feed intake and protein digestibility in ruminants systems (Ngwa and Tawah, 2002; Fasae

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and Alokun, 2006). Also, enzyme supplementation may be useful in reducing the toxicity of cassava peels and also make corn cob digestible to animals (Eniolorunda, and Rowaiye, 2008). This suggests the need to shift focus on some agricultural wastes with possible outcome in the production of livestock industries. The study aims at examining the dry matter acceptability and nutrients digestibility by West African dwarf rams fed polyenzyme treated cassava peel and corn cob based diets.

Materials and methods

Study area

This study was conducted at the Department Animal Production (sheep and goat unit), Teaching and Research farm, College of Agricultural Sciences, Olabisi Onabanjo University Ayetoro Campus, Ayetoro, Ogun State, Nigeria. Ayetoro is located at latitude 12° north and longitude 20° east in tropical region of Nigeria. The mean annual rainfall is 1250mm and average temperature of 26°C (Onakomaiya *et al.*, 1992).

Experimental management

A total of 16 indigenous breed of West African dwarf sheep (WAD) were purchased from the local market at Igbogila, Yewa North Ogun state, Nigeria. The age of animals ranged between 14 and 16 months. The rams were dewormed using ivermectin intramuscular injection at the rate of 1 mL per 50g weight; also rams were vaccinated against Peste des Petite ruminant (PPR) at the rate of 1 mL per 50kg weight of animal. Prophylactic antibiotic treatment with (oxytetracycline injection, tylosin, streptomycin and penicillin) were

applied, the quarantine and adjustment lasted for a period of two weeks. During this period, animals were group fed with dried cassava peels, *Gliricidia sepium* and *Leucaena leucocephala* and clean cool water was offered *ad libitum*.

Experimental design

Animals were allocated into 2 x 2 factorial experimental arrangements of four treatments (designated as T1, T2, T3 and T4) and balanced for weight with 4 animals per treatment in a completely randomized design. Each animal was allotted to individual pen with a size of 1.20 x 1 x 1.20

Feed preparation and feeding regime

The corn cobs and cassava peels were sourced from locally from maize and cassava producers dried (12% moisture content) and ground with 2mm mesh. *Gliricidia sepium* was collected within Olabisi Onabanjo University Teaching and Research Farm. Brewers Dried Grain (BDG), wheat offals (WO), oyster shell (OS) and Molasses were obtained from O'Yewa farm Ayetoro. The experimental diet was formulated into four (4) dietary treatments;

The animals on T1 were fed 50% of ground dried cassava peel thoroughly mixed with 25%GS, 15% BDG, 6%WO, 2% molasses, 1 % OS, and 1% Salt. Animals on T2 were fed 50% dried ground corn cob to replace cassava peel in dietary T2. For animals on T3 were fed ground dried 49.875% cassava peel treated with 0.125% polyenzyme while animals on T4 were fed ground dried 49.875% corn cob replaced cassava peel treated with 0.125% polyenzyme respectively. The feed was offered to the animals twice daily between the hours of 8a.m and 4p.m. the experiment lasted for 28 days

Table 1. Composition of experimental diets (%)

Ingredients	Dietary treatments			
	T1	T2	T3	T4
Cassava Peels	50	-	49.875	-
Corn Cobs	-	50	-	49.875
Gliricidia sepium	25	25	25	25
Brewers Dried Grain	15	15	15	15
Wheat Offals	6	6	6	6
Molasses	2	2	2	2
Oyster Shell	1	1	1	1
Salt	1	1	1	1
Poly-enzyme	-	-	0.125	0.125
Total	100	100	100	100

Acceptability

The animals were fed (4kg) of the four treatments in four different feeding troughs placed in strategic locations of each pens. Cafeteria technique has been used to assess the acceptability of some forage (Babayemi *et al.*, 2006; Ibhaze *et al.*, 2014). The sheep were allowed to feed for 4 hours from 8am to 12 noon daily. Consumption was measured by deduction of remnants from the amount of feed served. The feeding troughs were rotated daily to avoid adaptation. The forage preferred was assessed from the coefficient of preference (CoP) value, calculated from the ratio between the intakes for the individual forages, divided by the average intake of the forages (Karbo *et al.*, 1993; Ibhaze *et al.*, 2014). Percentage of Preference was calculated as the ratio of individual intake to total intake multiplied by 100 (Olorunnisomo, 2011; Ibhaze *et al.*, 2014). Feed treatments were ranked according to percentage preference. The trial lasted 14day (7 days acclimatization and 7 days acceptability trial).

Digestibility

Each animal was housed in individual metabolic cages (90 cm x 75 cm x 90cm) made of welded wire mesh fitted with removable feeders and arranged for quantitative collection of faeces and urine

separately. The trial lasted 14 days with a 7 days adaption period to accustom the animals to cage prior to a 7-day collection and measurement period. Total faecal output and urine were collected in the morning before feeding and watering. The faeces were weighed fresh and 10% aliquots of each day's collection for each animal were taken, dried at 60°C for 48hours in a forced draught air oven and bulked until analysed. The urine was collected in a plastic tray place under each cage and 10 mL concentrated H₂SO₄ (10%) was added to the tray daily to prevent volatilization of NH₃ from the urine. The total output of urine per animal was measured and 10% aliquots were saved in stoppered numbered plastic bottles and stored at -5°C until analysed. Nitrogen content was estimated by the micro kjeldhal method (Humphries, 1956) and crude protein was calculated (N x 6.25). The proximate and chemical composition of the feed and faeces were determined by the AOAC (2002). Nitrogen free extract was obtained by difference (Muller and Tobin, 1980).

Statistical analysis

Data were subjected to analysis of variance and significant means were separated by Duncan multiple range tests using the procedure of SAS (2002).

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Results and discussion

Table 2: Chemical composition of the complete mixed ration

Parameters	Dietary treatments				
	T1	T2	T3	T4	SEM
Dry matter	87.24 ^b	86.74 ^c	88.25 ^a	87.22 ^b	0.26
Crude Protein	11.02 ^c	11.87 ^a	11.40 ^b	11.75 ^a	0.31
Crude fibre	4.08 ^c	5.70 ^a	4.80 ^b	5.14 ^b	1.01
Ash	2.05 ^a	1.98 ^c	2.17 ^a	2.08 ^a	0.04
Ether extract	2.69 ^c	2.59 ^c	2.97 ^a	2.84 ^b	0.07
Carbohydrate	64.83 ^c	66.38 ^a	65.93 ^b	66.20 ^a	0.27
Energy	17.49 ^a	17.30 ^b	17.39 ^{ab}	16.69 ^c	0.15
NDF	74.42 ^c	78.54 ^a	75.70 ^b	73.11 ^d	1.15
ADF	48.45 ^b	50.74 ^a	49.13 ^{ab}	50.13 ^{ab}	0.75
ADL	15.89 ^d	21.47 ^a	18.09 ^c	20.35 ^b	0.89

^{abcd} Means within the same row differing in superscripts are significantly different (p<0.05)

The chemical composition of the experimental diets is shown in Table 2. The dry matter values were significantly different (P<0.05) across treatments. The range (86.74-88.25) was similar to that reported by Fajemisin *et al.* (2012a) in goats fed cassava peel substituted with graded levels of *Cajanus cajan* hay diet but lower than values obtained by Eniolorunda and Rowaiye, (2008) when corn husk supplemented with cassava leaf or *Leucaena* leaf meal based diet were fed to Yankassa sheep. Crude protein of T1 (11.02) was significantly lower (P<0.05) than T2 (11.84), T3 (11.40) and T4 (11.75). T2 and T4 were however similar (P>0.05). The crude protein of the experimental diets ranged from 8-14% recommended for ruminants body maintenance (Norton, 2003

and ARC, 1985). The decrease in the fibre fractions of the poly-enzyme treated mixed ration was probably due to the enzymatic action on the experimental diets. These agreed with report of Belewu and Fagbemi (2007) in WAD sheep fed *rhizopus* treated sawdust. There were significant differences (p<0.05) in NDF and ADF contents among the treatments. NDF of T2 (78.54) was significantly higher (P>0.05) than T1 (74.42), T3 (75.70) and T4 (73.11). The value obtained for ADF was highest in T2 (50.74) when compared to T1 (48.45), T3 (49.13) and T4 (50.13) respectively. The result obtained for NDF and ADF agreed with report of Fajemisin *et al.* (2012b) in West African dwarf sheep fed ensiled corn cob treated with or without water, Iye and urea.

Table 3. Dry matter acceptability by WAD rams fed experimental diets

Parameters	Dietary Treatment				SEM
	T1	T2	T3	T4	
Dry Matter Intake (g/h/d)	910.62 ^c	866.40 ^d	979.20 ^a	947.20 ^b	30.11
COP	0.98 ^c	0.93 ^d	1.06 ^a	1.02 ^b	0.03
Preference (%)	24.59 ^c	23.39 ^d	26.44 ^a	25.58 ^b	0.75
Rank	3 rd	4 th	1 st	2 nd	

^{abcd} Means within the same row differing in superscripts are significantly different (p<0.05)

The dry matter acceptability of the complete mixed ration is presented in Table 3. There were significant differences ($P<0.05$) across the treatments for dry matter intake. The dry matter intake was highest in T3 (979.20), followed by T4 (947.20) while T2 (866.40) had the least. The Cop and Pp of the diets varied significantly ($P<0.05$) across the treatments. The CoP values ranged between (0.9-1.6) while the overall percentage preference values also ranged between (23.39-26.44) respectively. The result obtained for acceptability trial

showed that animal in T3 (1.06 and 26.44%) had the highest consumption rate. This might be due to the polyenzyme inclusion in the diet that enhances fermentation and digestion. This finding was in agreement with (Ngwa and Tawah, 2002; Fasae and Alokun, 2006) who reported that supplemented cassava peel based diet with urea increases feed intake in ruminants. However, (Eniolorunda and Rowaiye, 2008; Ibhaze *et. al.*, 2014) also reported that inclusion of enzyme helps in reducing the toxicity in cassava peel and enhances digestion of corn cob by the animal.

Table 4. Digestibility of nutrient by WAD rams fed experimental diets

Parameters	Dietary treatments				SEM
	T1	T2	T3	T4	
Dry matter	70.08 ^b	61.93 ^c	78.81 ^a	72.32 ^b	4.11
Crude Protein	73.60 ^c	63.71 ^d	81.91 ^a	78.05 ^b	3.61
Crude fibre	65.50 ^c	60.76 ^d	70.24 ^b	76.09 ^a	4.17
Ether extract	33.33 ^c	32.77 ^d	37.40 ^a	35.26 ^b	2.91
NEF	70.70 ^b	66.90 ^c	80.05 ^a	79.11 ^b	3.07
NDF	66.10 ^b	60.17 ^c	76.99 ^a	78.80 ^a	4.11
ADF	64.57 ^b	60.56 ^c	71.69 ^a	75.75 ^a	4.01

^{abcd} Means within the same row differing in superscripts are significantly different ($p<0.05$)

The digestibility of nutrient of the experimental diets is shown in Table 4. Significant ($p<0.05$) difference were obtained for the digestibility percentages of all the proximate nutrients. The digestibility values recorded for T3 was the highest ($P<0.05$) for DM (78.81), CP (81.91), CF (70.24), EE (37.40), NEF (80.05), NDF (76.99) and ADF (71.69). This could be attributed to the inclusion of enzyme that aid in the breaking of the cellulolytic and lignified bond to release the required nutrients to the animal. Eniolorunda, *et. al.*, (2008) reported that highly degradation of cell wall fraction of corn cob and cassava peel enhanced the ability of ruminant animal to process structural carbohydrate in the rumen and obtained desirable nutritional benefit to the animal. However, it was classified by FAO

(1995) that digestibility of feed is high (>60%), medium (40-60%) and low (<40%). It was concluded that, the present study falls between the highest values recorded by the FAO.

Conclusion and recommendation

It was recorded from the results that inclusions of polyenzyme to cassava peel and corncob have a promising acceptability, enhanced and efficiently utilized by sheep. The study shown that treatment of cassava peels and corn cob with polyenzyme improved and sustain ruminants during period of feeds insufficiency. Also, provide a better utilization of wasteful corn cob and cassava peel to feedstuff so as to improve farmers that practice intensive ruminant management. However, for effective utilization of corn cob and cassava peels, it

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is therefore recommended that it should be formulated with adequate available feed with additive to enhance the acceptability of the feedstuff by the animals.

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