

# Assessment of the intake and digestibility of *Panicum maximum* by supplementation with cassava peels using West African dwarf goats.

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## Abstract

Three rations — 100% *Panicum maximum* (T1), 100% cassava peels (T2) and 70% (w/w) *Panicum maximum* plus 30% cassava peels (T3) — were fed to 6 intact does and 6 intact bucks of the West African Dwarf (WAD) breed in a completely randomised experiment. Two bucks and two does were randomly assigned to each treatment.

Effect of sex on dry matter intake (DMI) was not significant ( $P > 0.05$ ). Treatment effect on DMI was significant ( $P < 0.05$ ). Goats on T3 consumed the highest dry matter (DM), organic matter (OM), dietary nitrogen, digestible dry matter (DDM), digestible organic matter (DOM), ash, digestible dietary nitrogen and digestible neutral detergent fibre (DNDF) while those on T2 consumed the least.

Treatment but not sex of animal had significant effect on dry matter and nutrient digestibilities ( $P < 0.05$ ). The DM of T2 was digested most, while that of T1 was the least digested.

The intake and digestibility of *Panicum maximum* by goats were increased by supplementation with cassava peels.

## Introduction

Guinea grass (*Panicum maximum*), a widely distributed grass in Nigeria, is highly relished by ruminant animals. It has 23.5-29.9% dry matter (DM) at harvest (Olubajo 1977; Aken'ova and Mohamed-Saleem 1982) and a residual DM content of 78.0-91.7% (Carew *et al.* 1980; Olubajo 1977). Its crude protein (CP) content (on DM basis) ranges from 4.9-12.8% compared with 29.5-49.2% for its crude fibre (CF) (Carew *et al.* 1980; Ademosun and Baumgardt 1977; Olubajo 1977; Akinyemi and Onayinka 1982; Aken'ova and Mohamed-Saleem 1982).

Cassava peels are a major byproduct of the cassava tuber processing industry. In part of Nigeria where cassava is grown and the tuber processed, the peels are largely unutilized or under-exploited as a livestock feed. The following ranges have been reported for cassava peels: residual DM, 86.5 to 94.5%; organic matter (OM), 89.0 to 93.9%; CP, 4.4 to 6.5%, and CF, 10.0 to 31.8% (Onwuka 1983; Adegbola 1980; Carew 1982; Oyenugbo 1968).

Information on intake of *Panicum maximum* and cassava peels by goats is rather scanty. According to Ademosun *et al.* (1985) goats consumed an average of 48.8 (range: 43.1 to 54.9) g.kg.<sup>-0.75</sup> d DM and 27.8 (range: 19.8 to 40.6) g.kg.<sup>-0.75</sup> d DM from *Panicum* at different stages of regrowth. The observed mean apparent digestibility coefficient (ADC) was 55.8%. Onwuka (1983) reported an ADC of 57.6% for the DM of cassava peels fed to WAD goats.

The widespread distribution of *Panicum* and the preponderance and underutilization of cassava peels as goat feed formed the basis of the present study. The research was undertaken to investigate the influence on intake and digestibility of feeding cassava peels with *Panicum* to WAD goats.



## Materials and methods

Twelve intact goats (6 bucks and 6 does), aged 6 to 9 months and weighing an average of 6.05 kg (range: 5.0 to 10.0 kg), from the University of Ibadan Teaching and Research Farm, were first rid of their internal and external parasites by use of appropriate drugs. They were then housed in previously disinfected individual metabolism cages and offered liberal but known quantities of the experimental diets daily for a 21-day preliminary period to adapt the animals to the diets and the cage environment. The animals also received cool fresh water and salt lick free choice in the cages. During this period, the daily voluntary feed intake was determined. Total faeces from the experimental animals were collected during the next 7 days (day 22–28).

Fresh *Panicum maximum*, chopped to about 2.0 cm length, was obtained daily from the International Livestock Centre for Africa (ILCA) plots at the International Institute of Tropical Agriculture (IITA), Ibadan between April and May, 1985. Cassava peels were obtained fresh from local cassava grating plants in and around the University of Ibadan campus. The cassava peels were sundried for 3 to 4 days, depending on the intensity of the sun, packed into jute bags and stacked away in the store on some raised wooden planks until required for feeding.

The diets fed to the goats were 100% fresh *Panicum maximum* (T1), 100% sundried cassava peels (T2) and 70% (w/w) fresh *Panicum maximum* plus 30% sundried cassava peels (T3). The amount of each diet offered to each experimental animal ensured a 5% leftover. Residues were collected after a 24 hour feeding, weighed and the voluntary intake determined.

Samples of *Panicum maximum* and cassava peels offered and rejected during the collection period were taken daily. A subsample of each was dried in a forced draught oven at 100–105°C for 48 hours for DM determination. Another subsample was dried at 60°C for 48–72 h for chemical composition analysis. The subsamples for the whole collection period were bulked, milled in a Christy-Norris laboratory hammer mill, thoroughly mixed, stored in bottles fitted with air-tight screwcaps and kept in a dark cupboard until required for analysis.

Total faeces were collected in the mornings before feeding and watering during the last 7 days of the experiment as described by Oyenuga (1961), Akinsoyinu (1974) and Onwuka (1983). The faeces were weighed fresh and 10% aliquot of each day's collection for each animal was taken, dried at 60°C for 48–72 h in a forced hot air draught oven and bulked. A subsample of faeces from each animal was dried in a forced hot air draught oven at 100–105°C for 48–72 h for DM determination. The 7-day faecal samples for each experimental animal were thoroughly mixed, milled in a Christy-Norris laboratory hammer mill to pass 0.6 mm sieve and put in sealed polythene bags. These were then stored in a cupboard at room temperature until required for analysis. 5 g of the milled faeces were dried in an oven at 100–105°C for 48 h to determine residual moisture.

The milled samples of *Panicum*, cassava peels and faeces were analysed for DM, total ash, OM, nitrogen (N) according to the Association of Official Agricultural Chemists (A.O.A.C. 1975) procedures and acid detergent fibre (ADF) and neutral detergent fibre (NDF) according to the methods of Goering and Van Soest (1970) and Van Soest and Robertson (1980).

The data obtained were subjected to analysis of variance. Differences between treatment means were determined by Duncan's (1955) multiple range test with the aid of computers at the IITA, Ibadan.



## Results and discussion

### Chemical composition

The chemical composition of the experimental diet components is as shown in Table 1. The 'as fed' DM content of 24.7% for *Panicum maximum* compared favourably with the range of 23.5 to 29.9% reported elsewhere (Olubajo 1977; Aken'ova and Mohamed-Saleem 1982). The N content (1.7%) of *Panicum* in the present study was similar to a value of 1.8% reported by Aken'ova and Mohamed-Saleem (1982) and within the normal range for grasses.

Table 1: Chemical composition of *Panicum maximum* and cassava peels fed to West African dwarf goats.

Chemical components	<i>Panicum maximum</i>	Cassava peels
DM (%)		
'As fed'	24.66	86.41
Residual	88.93	87.28
SD	$\pm 0.33$	$\pm 0.17$
ON DM BASIS		
OM	37.65	89.25
SD	$\pm 0.56$	$\pm 1.84$
ADF	40.18	23.85
SD	$\pm 1.42$	$\pm 3.52$
NDF	65.41	34.27
SD	$\pm 1.48$	$\pm 4.33$
N	1.69	0.96
SD	$\pm 0.21$	$\pm 0.38$

The residual DM content of cassava peels was 87.3% (Table 1) which compared favourably with a range of 86.5 to 94.59 (Adegbola 1980; Onwuka 1983). OM (89.3%) value for cassava peels in this study was similar to 89.0 to 93.9% (Carew 1982). The low ADF (23.9%) and NDF (34.3%) values reported here were in agreement with CF values (10.0 to 31.8%) (Adegbola 1980; Onwuka 1983; Oyenuga 1968). Similarly, the N content of 1.0% (Table 1) compared very favourably with those (0.7 to 1.1%) reported by Carew (1982), Onwuka (1983) and Adegbola (1980).

### Intake

The DM and nutrients intake by WAD goats is summarised in Table 2. The DM intake (DMI) of  $41.5 \text{ g.kg}^{-0.75} \text{ d}^{-1}$  by goats on T2 was significantly ( $P < 0.05$ ) lower than 63.5 and  $73.8 \text{ g.kg}^{-0.75} \text{ d}^{-1}$  for animals on T1 and T3 respectively, which in turn, were not significantly different ( $P > 0.05$ ). The  $10.3 \text{ g.kg}^{-0.75} \text{ d}^{-1}$  arithmetic difference in DMI between T1 and T3 could be of nutritional and economic significance in the long run. The nutrient intakes from T1 and T3 were not significantly different ( $P > 0.05$ ). The DMI from T1 ( $63.5 \text{ g.kg}^{-0.75} \text{ d}^{-1}$ ) was higher than  $48.8 \text{ g.kg}^{-0.75} \text{ d}^{-1}$  reported by Ademosun *et al.* (1985) probably because the grass was young and nutritious, being harvested during the early part of the rainy season. It is hoped to compare grass DMI by goats during the late rainy season (September/October) in the next phase of the experiment. However, this DMI value from T1 compares favourably with  $54.9 \text{ g.kg}^{-0.75} \text{ d}^{-1}$  reported also by Ademosun *et al.* (1985) for *Panicum* harvested at 30 days of regrowth.



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**Table 2:** Dry matter and nutrient intake by West African dwarf goats fed *Panicum maximum* and cassava peels (g.kg<sup>-0.75</sup>.d<sup>-1</sup>)

Treatment	1	2	
<b>Nutrient</b>			
DMI	63.48a	41.45b	7
SE	10.20	1.01	
OMI	55.11a	37.69b	6
SE	7.59	0.93	
ADFI	27.50a	8.30b	2
SE	4.68	0.20	
NDFI	44.41a	10.94b	4
SE	7.01	0.27	
NI	1.07a	0.43b	
SE	0.18	0.01	

★ Means with the same letter in each row are not significantly different (P>0.05)

Treatment 1 = 100% *Panicum maximum*

Treatment 2 = 100% cassava peels, and

Treatment 3 = 70% *Panicum maximum* + 30% cassava peels.

### Digestibilities

The apparent digestibility coefficients (ADC) for DM and other nutrients are presented in Table 3. The DM digestibility (DMD) of T1, T2 and T3 were statistically different (P<0.05). The DMD for T1 (58.8%) was similar to 55.8% reported by Ademoseun *et al.* (1988).

**Table 3:** Dry matter and nutrient digestibility coefficients (%) ★ by West African goats fed *Panicum maximum* and Cassava peels supplement.

Treatment	1	2	
DMD	58.79a	74.95b	
SE	0.36	1.84	
OMD	61.08a	77.35b	
SE	0.40	1.90	
ADFD	60.06a	33.38b	
SE	2.01	0.80	
NDFD	54.49a	38.61b	
SE	1.67	0.95	
ND	27.10a	-6.24b	
SE	14.27	0.16	

★ Means with the same letter in each row are not significantly different (P>0.05). Treatments 1, 2 and 3 are the same as in Table 2.

and within the range of 46 to 79% (Hacker and Minson 1981). The highest DM and digestibility of T2 were probably due to its lowest intake since digestibility and intake are inversely related (Van Soest 1982; Johnson 1966; Wagner and Loosli 1967). Similar OM digestibility by animals on T1, T2 and T3 was significantly different (P<0.05) with

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highest value (77.4%) for goats on T2. The total ash digestibility values were not significantly different ( $P > 0.05$ ). This suggested that digestibility of ash was of no practical significance in this experiment.

Diets had significant influence ( $P < 0.05$ ) on N digestibility. The N in T3 was digested most. This suggested that the fermentable OM in cassava peels apparently encouraged higher N digestibility (McDonald *et al*, 1973).

Nitrogen digestibility of T2 was negative due, probably, to the low N content (Table 1) of the peels. This is because ADC of dietary N is particularly dependent on the proportion of N in the feed. Consequently, T2 actually reduced the digestible N supply of the goats (McDonald *et al*, 1973). Also the level of N ADC could have been due to the level of feed intake (Owens and Bergen 1983).

The ADE of T1 and T3 was digested by goats to about the same extent (Table 3). The NDF digestibility by goats on T1, T2 and T3 was, however, significantly different ( $P < 0.05$ ). The high NDF digestibility coefficient by animals on T3 tended to suggest that NDF was digested better when both *Panicum* and cassava peels were fed simultaneously in the ratio of 7:3.

**Table 4:** Disgestible dry matter and nutrient intake ( $\text{g} \cdot \text{kg}^{-0.75} \cdot \text{d}^{-1}$  ★) by West African dwarf goats fed *Panicum maximum* and cassava peels supplement.

Treatment	1	2	3
<b>Components intake</b>			
DDMI	37.35a	31.08b	47.87c
SE	5.41	1.52	5.36
DOMI	33.60a	29.17a	43.42b
SE	4.85	1.43	4.61
DADFI	16.61a	2.69b	15.65a
SE	3.33	0.13	1.71
DNDFI	24.31a	4.22b	25.60a
SE	4.52	0.21	3.80
DNI	0.32a	-0.03b	0.62c
SE	0.19	0.00	0.06

★ Means with the same letter in each row are not significantly different ( $P > 0.05$ )

Treatments 1, 2 and 3 are the same as in Table 2.



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The intake of digestible DM (DDMI) and other digestible nutrients by goats is shown in Table 4. The DDMI was significantly different ( $P < 0.05$ ) for all dietary treatments. The highest DDMI value of  $47.8 \text{ g.kg}^{0.75} \cdot \text{d}^{-1}$  was recorded for goats on T3. The superiority of T3 over T1 and T2 was observed in the amount of DOM and DN consumed from the diets. This suggested that supplementation of *Panicum* with cassava peels was beneficial to goats. It is, therefore, suggested that *Panicum* and cassava peels, when they must be fed to goats, be offered in suitable proportions to ensure maximum utilization of the feeding stuffs.

Earlier workers have indicated inclusion of cassava peels to varying degrees in livestock feeds. Adegbola (1980) concluded that 10% cassava peels meal inclusion in pig ration induced fastest rate of gain and highest feed conversion efficiency. Onwuka (1981), on the other hand, concluded that 25% cassava peels: 75% browse was the best proportion for goats in terms of intake, digestibility and other performance parameters. In the present study, a 30% level of cassava peels has been shown to be beneficial to goats. However, the actual amount of cassava peels suitable for inclusion in goat feeds is a subject for further research.

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