Improving the feed Utilization of Cassava Peels in smallholder goat production

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Abstract

Cassava peels at 25, 50 and 100% were supplemented with varying levels of palm kernel cake with a basal diet of *Pennisetum purpureum* in an experiment designed to measure its nutritive values and effect on the growth and biochemical parameters of West African Dwarf goats under stall feeding conditions. Goats on 100% cassava peels (CPL) recorded the least dry matter intake (DMI). The supplementation of CPL with PKC significantly increased ($P < 0.05$) the DMI for goats on 25 and 50% CPL with those on 50% CPL having the highest DMI. The dry matter, crude protein and crude fibre of goats on 50% CPL were most digested ($P < 0.05$) while those on 100% CPL were the least. The lower intake and digestibility of dry matter and crude protein by goats on 100% CPL reflected a significantly ($P < 0.05$) low body weight change (0.55kg) compared to the other treatments. There were no significant differences ($P > 0.05$) between the values for all the blood parameters monitored in the study as all fell within the normal range for goats. It was concluded that cassava peels can have a great potential for goat feeding as its feeding value can be improved by supplementing with a protein source, such as palm kernel cake.

Keywords: Feed utilization, goats, cassava peels, palm kernel cake

Introduction

Recent trends in animal nutrition in Nigeria based on the principles of minimum input and efficient feed utilization have focused attention on the utilization of non- conventional sources of feed such as farm by- products in ruminant feeding. Cassava peel has become an important by-product in Nigeria and is available from the local processing of cassava root for gari as well as from the newly introduced, large scale plants producing gari and starch (Adegbola and Asaolu, 1986; Iyayi and Tewe, 2003). In the smallholder traditional system, small scale farmers at village level own an average of 1-4 goats (Ekpenyong and Onwuka, 1987; Lapkini,

C.A.M. 2002) and it is not unusual for these goats to be given supplements of fresh cassava chips in the morning or evening. Cassava peels from the processing of the roots for starch, cassava flour or tapioca and gari are also fed to these animals.

Cassava peels have been found to be a source of energy in ruminant feeding systems, serving either as the main basal diet or as supplement (Baah *et-al*, 1999; Asaolu and Odeyinka, 2006). They are rarely fed fresh because of the high cyanogenic glycoside in the material. Sun drying, ensiling and fermentation are used to reduce the concentration of glycosides to tolerable levels (Smith, 1992; Akinfala and Tewe, 2002).

This project was designed to study the effect of improving the utilization of cassava peels by supplementing with varying levels of palm kernel cake with a basal diet of *Pennisetum purpureum* which are readily available to most smallholder goat farmers in South Western Nigeria. The feed intake, digestibility, live weight changes and biochemical parameters were monitored.

Materials and methods

Growing goats of West African Dwarf breed were allocated to three groups of four at the Small Ruminant unit of the Teaching and Research Farms, University of Agriculture, Abeokuta, Nigeria in an experiment that lasted for 12 weeks. The goats were approximately 9 months old and had an average weight of 10kg. They were dewormed prior to the experiment with albendazole tablets and given long acting antibiotics. Cassava peels were offered to the animals in three dietary treatments A, B and C of 25, 50 and 100% supplemented with palm kernel cake (PKC) at 75, 50 and 0% respectively while 100g of *Pennisetum purpureum* which served as a basal diet was given to the animals. The diets were offered to the animals at 4% of their body weight with clean water and mineral salt licks provided freely. Fresh cassava peels were collected from the gari processing factory of the University of Agriculture, Abeokuta, and sun dried for 10 days while the *Pennisetum purpureum* were harvested fresh on daily basis within the campus and chopped. Group dry matter intake was recorded daily and each goat was weighed once a week. Feed offered and refusals were sampled weekly and dried in a draught oven and milled through a 2mm sieve for laboratory analysis. At the last 7 days of the experiment, the animals were transferred to different metabolic crates for the digestibility trial. Total daily faecal output was measured for each animal and 10% sample taken and dried to constant weight in a hot dry oven at 105°C to determine the chemical

composition of the faecal samples. The nitrogen content of feeds and faeces were determined using Kjeldhal method. Ground feeds and faeces were analysed for crude fibre, ether extract and ash as described by AOAC (1990). Results obtained were used for calculation of digestibility of nutrient for the experimental animals.

About 5mls of blood was also collected from each of the animals at the beginning and end of the experiment by jugular vein puncture in heparinised bottles to prevent blood coagulation. They were taken to the laboratory to determine the packed cell volume (PCV), red blood cells (RBC), white blood cells (WBC), glucose, blood urea nitrogen (BUN), and total protein (TP). Data from the experiments were subjected to analysis of variance by method of SPSS, (1999) and significant means were separated by Duncan (1955) multiple range test.

Results and Discussion

The chemical composition of the experimental diets is shown in Table 1. The chemical components of CPL and PKC of this study compared well with values reported in the literature (Oyenuga, 1968; Adegbola and Asaolu, 1986; Ifut, 1992; Abonyi and Uchendu, 2005).

The DM and nutrient intakes of WAD goats are summarized in Table 2. The least DM intake (DMI) in diet C was probably due to the lowest crude protein content of CPL. This is supported by Preston and Leng, (1986) and Ifut (1992) who had earlier reported that low nitrogen content of feeds significantly ($P<0.05$) reduced the DMI from such feeds. The supplementation of CPL with PKC increased the DMI for goats on diets A and B with diet B having the highest DMI ($P<0.05$). The intakes (71.68 - 91.54g/kgW^{0.75}) per day recorded in this study were remarkable, and slightly fell within the range (87 -108g/kgW^{0.75} per day) reported by Adegbola *et al* (1988) when they fed CPL diets containing adequate amounts of nitrogen to WAD sheep. However, lower

Table 1: Chemical composition of the experimental diets (%) fed to WAD goats.

Parameters	Diet A	Diet B	Diet C	P.K.C.
Dry matter	89.26	89.67	89.03	92.00
Crude protein	12.50	17.24	5.11	16.10
Crude fibre	13.07	14.37	9.48	14.50
Ash	7.47	6.89	5.84	6.60
Ether extract	5.16	5.63	5.95	7.90
Nitrogen free extract	61.80	55.87	73.62	41.04

Table 2. Average dry matter, nutrient intake (g/day) and weight gain (kg) by WAD goats fed cassava peels supplemented with palm kernel cake.

Parameters	Diet A	Diet B	Diet C	± SEM
DM Intake	334.40 ^b	412.53 ^a	297.80 ^c	18.56
CP Intake	58.53 ^b	60.50 ^a	15.73 ^c	1.28
CF Intake	43.71 ^a	53.53 ^a	39.18 ^b	1.93
EE Intake	17.26	20.67	18.31	1.03
ASH Intake	25.88	25.67	17.18	1.12
NFE Intake	192.77	211.86	226.60	8.44
DM W ^{0.75kg}	84.80 ^b	91.54 ^a	71.68 ^c	2.08
Initial weight (kg)	8.60	9.48	9.35	0.47
Final weight (kg)	10.63	12.16	9.90	0.93
Weight gain (kg)	2.03 ^b	2.68 ^a	0.55 ^c	0.09
Weight gain W ^{0.75kg}	1.70 ^b	2.06 ^a	0.64 ^c	0.31
Daily weight gain (g/day)	27.74 ^b	31.90 ^a	6.55 ^c	1.07
Feed conversion ratio	13.66 ^b	12.93 ^c	45.47 ^a	2.22

Means on the same row with different superscripts are significantly different ($P < 0.05$)

values (59 – 68g/kg W^{0.75}) were reported by Tuah *et al* (1992) when they fed Djallonke sheep with cassava peels supplemented with varying levels of PKC. This variation may be due to the breed differences and the processing method obtained in the feed production.

The DM and other nutrients digestibility coefficients are presented in table 3. The DM, CP and CF of diet B were most digested ($P < 0.05$) by goats while those on diet C were the least. The lower digestibility of DM and CP by goats

on diet C was reflected in the low body weight change (0.55kg). This suggests that goats cannot subsist on CPL alone which is in accordance with the findings of Ifut (1992) who recorded negative body weight gain for goats fed CPL alone. Diet B with 50% CPL was digested most by goats, probably due to a better balance of nutrients resulting from the simultaneous feeding of 50% PKC.

Diets had a significant effect on the body weight changes of goats (table 2). Goats on diet C had

Table 3. Nutrient digestibility (%) of the experimental diets fed to WAD goats

Parameters	Diet A	Diet B	Diet C	± SEM
DM	50.25 ^b	59.25 ^a	39.75 ^c	1.50
CP	57.09 ^b	58.25 ^a	48.25 ^c	1.28
CF	52.05 ^b	62.75 ^a	43.03 ^c	1.93
EE	55.75	59.25	55.13	1.03
ASH	64.00	64.75	54.75	1.12
NFE	42.75	47.50	38.25	1.30

Means on the same row with different superscripts are significantly different ($P < 0.05$)

Table 4: Biochemical parameters of WAD goats fed cassava peels supplemented with palm kernel cake.

Parameters	Diet A	Diet B	Diet C	± SEM
PCV (%)	25.50	29.25	24.75	1.34
WBC (μ /L)	11.96	12.33	12.60	0.31
RBC (μ /L)	13.55	13.20	13.92	0.32
Glucose (mmol/L)	2.93	3.75	3.62	0.61
TP (mmg/L)	6.88	6.97	6.75	0.77
BUN (mmol/L)	4.31	5.19	4.19	0.91

Mean values in the same row are not significantly different ($P > 0.05$)

the lowest body weight change probably due to the low nutritive value of the feed. This suggests that CPL is a poor feed when taken as a sole feed. The highest daily body weight gain of 31.90g/day was by goats on diet B, probably because it provided a better balance of nutrients for growth. Also, the results of this study agrees with the findings of Fomunyan and Meffeja (1987) who reported an increase in the DMI, digestibility and growth rate of sheep fed on three levels of dried CPL (0, 35, 70) in combination with *Pennisetum purpureum* at 70, 35 and 0% of diet respectively with cotton seed cake supplied as a protein source. This however indicates that CPL is potentially beneficial to goats by improving the balance of nutrients which agrees with earlier works by Onwuka (1983) and Ifut (1992) who have

indicated inclusion of CPL in varying degrees in livestock feeds.

The mean values for blood metabolites of goats, as measured in the study are presented in table 4. The TP and PCV recorded in this study were statistically similar ($P > 0.05$) and fell within the normal range (6.4 - 7.0mmg/L and 15-30%) respectively for goats as reported by Orheruata *et al.* (2004) and Daramola *et al.* (2005) for the same breed of goat. Animals on diet B had the highest TP and PCV values of 6.97mmg/L and 29.25% respectively followed by those on diet A with 6.88mmg/L and 25.50% and diet C having the least values 6.75mmg/L and 24.75%. This however indicated that all the animals were healthy throughout the period of the experiment.

There were no significant difference ($P > 0.05$) between the values for plasma glucose reported in this study as all fell within the normal range as reported by Meyer and Harvey, (1998). The lowest value was recorded for animals on diet A (2.93 mmol/L), while the highest value was for diet B (3.75 mmol/L).

No significant effect ($P > 0.05$) was also recorded for BUN on animals fed the experimental diets. Highest value was recorded for diets B (5.19 mmol/L) followed by diet A and C with 4.31 and 4.19 mmol/L respectively and this values fell within the normal range for goats as reported by Puls, (1994). This result agrees with the results of Aregheore and Oluokun, (1989) who reported that the inclusion of cassava peels up to 24% in sheep ration does not have any effect on BUN. Moreover, the values recorded for RBC and WBC in this experiment fell with the range reported by Daramola *et al*, (2005) for WAD goats and Tambuwal *et al*, (2002) for Red Sokoto goats. However, there was no death recorded in this study, which is not in accordance with the results of Tuah *et-al*, (1992) who reported poor performance resulting in the death of Djallonke sheep when fed CPL supplemented with varying levels of PKC. This might however be attributed to the 100g of *Pennisetum purpureum* used as a basal diet in this study which probably increased the performance of the goats. Also, the method of processing of CPL and PKC may also be a contributing factor.

Conclusion

The findings of this study clearly support earlier observations that goats cannot subsist on cassava peels alone. However, cassava peels has a great potential for smallholder goat feeding as its feeding value can be increased by supplementing with a protein source, such as palm kernel cake. Also the experimental diets had no effect on the blood parameters monitored as

all fell within the normal values for goats. Goats therefore will benefit more from being fed cassava peels and palm kernel cake in approximately equal proportions with a basal diet of *Pennisetum purpureum*.

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