Availability of cassava residues and by-products for goat production in cassava based farming system

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Abstract

A study was carried out to investigate into the availability of cassava residues and by-products and the utilization of the residues for goat production in Odeda local government area of Ogun state. Data was collected through a structured questionnaire coupled with occasional farm visits and personal interviews, from the farmers involved in the production of goats and cassava. Results showed that cassava is a major crop in the area and the cultivation of different cassava varieties is common. Cassava leaves, peels and sieviate were the common residues and by-products available and most farmers used these residues to feed their goats. The response of goats to cassava residues based diets was investigated using sixteen (16) West African dwarf goats, aged 4 to 6 months with average body weight of 6.5kg in a completely randomized design. The four treatments used namely (diets A to D) contained varying levels of cassava leaves, peels and sieviate and were replicated four times. Goat's performance increased ($P < 0.05$) with increasing level of cassava leaves in the diets. Weight gain of goats ranged from 30.02 to 37.85g/day across the dietary treatments. In conclusion, cassava residues are readily available in the study area and the response of goats fed diet C consisting 50% cassava leaves, 30% cassava peels and 20% cassava sieviate produced the best performance in terms of feed intake, digestibility and weight gain. This can therefore be recommended as best combination strategy in making use of cassava residues in goat feeding in Nigeria.

Keywords: Cassava residue and by-products, goat, performance, Odeda, Ogun state

Introduction

Cassava is one of the most important staple food crops widely cultivated in the lowland humid tropics. It plays a major role in the efforts to alleviate African food crisis because of its efficient production for energy, year round availability, tolerance to extreme conditions, and suitability to present farming and food systems in Africa (Hahn, 1992). Nigeria is currently the world's largest producer of cassava (IITA, 2005) and over four fifth of its cultivable land area is suitable for growing cassava. The recent call by the Federal Government for increased production and export of cassava products have stepped up cassava

cultivation and the high agronomic potential of cassava has therefore been fully exploited to drastically increase production and thus provide enough cassava and its by products for use in feeding livestock without adversely affecting the needs for human consumption.

In Nigeria, goats are important livestock for food and securities where they are most kept by smallholders (Adu *et al*, 2004). Most goat farmers have been reported to use cassava products in the feeding of their animals thereby using varying amounts on their preserved form while they hardly invest in established pastures (Onwuka 1992, Fasae *et al.*, 2006). While the use of

cassava and its by-products for livestock feeding has been advocated by many researchers, its nutritional characteristics require a careful balancing for nutrients in which it is deficient, in order to ensure the satisfactory performance of livestock and cost effectiveness. This study was designed to collect data on the availability of cassava residues and by-products in Odeda Local Government area of Ogun state, Nigeria and performance of goats fed diets formulated using their mixture in different proportions as a means of enhancing crop livestock production system.

Materials and Methods

Study area

The survey work on the availability of cassava residues was conducted in ten (10) communities in Odeda Local government area of Ogun state, Nigeria and data collected from 30 respondents from each community while the feeding trial on cassava residues and by-products utilization was carried out at the Small Ruminant Unit of the Teaching and Research Farm, University of Agriculture, Abeokuta, Nigeria. Both locations are situated in the derived savannah vegetation zone of South Western Nigeria. The economy of these communities is based mainly on subsistence farming and the farmers are involved in mixed cropping with livestock production

Data collection on availability of cassava residues

A structured questionnaire was designed

coupled with occasional farm visits and personal interviews to collect data from the farmers' involved in cassava and goat production in the study area. The farmers herd was selected randomly from each of the communities. The head of household from each village was interviewed regarding the goats owned and questions were asked regarding the extent of usage of cassava residue in feeding the goats. Data were collected on the number of goats kept, hectares of cassava produced, species of cassava planted, types of cassava post-harvest residues, source of residues, processing methods adopted and the performance in terms of weight gain and productivity of goats fed cassava residues.

Cassava residues collection and processing

The cassava residues used in the diets were cassava leaves, peels and sieviate. The leaves were collected fresh during harvest from cassava variety TMS 30572. They were chopped with a cutlass, sun-dried and stored in bags until when required. The peels and sieviate were collected from the gari processing units of the University of Agriculture, Abeokuta, sun dried and milled before incorporating into the experimental diets (Table 1). The experimental diets comprised varying proportions of cassava residues and by-products namely cassava leaves, peels and sieviate while grass mixture served as the control diet. Experimental diets were offered to the goats at 4% of their body.

Table 1: Experimental diets fed to West African dwarf goats

Parameters	Diet A	Diet B	Diet C	Diet D
Cassava leaves	20	30	50	-
Cassava peels	30	50	20	-
Cassava sieviate	50	20	30	-
Grass mixture*	-	-	-	100

* Grass mixture- Combination of *Panicum maximum* and *Pennisetum purpureum* at ratio 1:1

Experimental animals and management

Sixteen (16) growing West African dwarf (WAD) goats, aged 4 to 6 months with average body weight of 6.5kg purchased from goat's farmers in the surveyed villages were used. The animals were quarantined for 30 days prior to the experiment, during which they were given a prophylactic treatment of Terramycin L.A. (1ml/10kg body weight) and dewormed with albendazole tablets (12.5g/kg body weight). They were also treated against ectoparasites by bathing them with diazintol solution at 5ml/litre. PPR vaccine was administered against *Pestes des Petit Ruminante*. The goats were then allotted to 4 treatments with 4 replicates each in a completely randomized design using individually open sided well ventilated and disinfected pens, with slatted floors to prevent the animals from coming in contact with their faeces and urine. The goats were allowed to adapt to the experimental diets for two weeks before commencement of data collection.

Daily feed refusals were measured to determine intake. Initial body weights of the animals were taken in the mornings at the beginning of the study and subsequent body weight changes also taken weekly interval for the period of the experiment. At the last seven days of the experiment the goats were transferred to individual

metabolic cages for the digestibility trial. Total daily faecal output was also collected and faecal samples was taken and dried to constant weight in a hot dry oven at 105°C to determine the moisture content and stored until when required for analysis.

Blood samples were also collected through jugular vein puncture at the end of the experiment to determine the effects of the diets on the packed cell volume, total protein, haemoglobin and blood urea nitrogen.

Chemical and statistical analyses

Ground feeds and faeces were analysed for crude protein, ether extract and ash as described by AOAC (1990). Results obtained were used for the calculation of digestibility of nutrient by the experimental animals.

Data emanated from the study were analysed statistically using Analysis of variance and descriptive statistics of SPSS for Windows Version 11.0 (SPSS, 1999). Mean comparison where significant differences were observed was by Duncan multiple range test (Duncan, 1955).

Results and Discussion

Table 2 shows the data on cassava production in the study area. The major varieties of cassava cultivated in the study area included TMS30572, TMS30001, TMS95/0166, TMS98/0581 and

Table 2: Percentage of different varieties of cassava planted in the study areas.

S/no.	Cassava variety	Common names	Hectare planted annually
1	TMS30572	Texaco	29.4
2	TMS30001	Oko Iyawo	17.6
3	TMS95/0166	-	12.7
4	TMS98/0581	Odongbo	13.2
5	TMS95/0510	Orehendemu	11.8
6	Others	-	15.3

Figure 1: Types of cassava residues and by products (%) utilized by goats in the study areas.

TMS95/0510. However, TMS30572 was the most common cultivated followed by TMS30001 variety. However, the average data collected across the surveyed communities showed that cassava is a major crop and its cultivation is common with various varieties been planted.

Figure 1 shows the types of cassava residues used for feeding the goats in the studied areas. 75% of the respondents used cassava peels, 26% used cassava leaves while 9% used cassava sieviate for feeding their goats. Cassava peels are regularly used in feeding goats because of its availability after the processing of tuber within the community.

The low usage of cassava leaves and sieviate as feed for goats by the respondents was however attributed to the difficulty in transportation of these leaves from the farm to the villages where the goats are kept, while cassava sieviate were only available during gari is production.

Table 3 shows data on utilization and performance of different types of cassava residues by goats. Results showed that the rate of feeding of cassava peels to goats was more than cassava leaves and sieviate. However, these residues maybe processed before been fed to goats. Various methods of processing adopted are peeling of cassava tubers, soaking tubers in streams or pots, grating, pressing of grated tubers and sieving to obtain the sieviate. This traditional processing achieved detoxification through cell rupturing which is further improved upon by heating, drying, and boiling. Moreover, better performance in goats fed cassava leaves alone compared to the other residues was reported by the respondents. This could be attributable to the high protein content of cassava leaves coupled with the contents of vitamins and minerals (Adegbola and Okonkwo, 2002).

The chemical composition of the cassava

Table 3: Data on rate of feeding, processing and performance of goats fed cassava residues and by-products. (n= 300)

Parameters	Cassava residues		
	Peels	Leaves	Sieviate
Feeding rate	189	71	40
Fed processed	74	131	105
Performance	62	155	83

based residues fed to goats is shown in Table 4. The CP content of cassava peels, leaves and sieviate was within the range reported for most cassava varieties by earlier authors (Alli- Ballogun *et al.*, 2003, Asaolu and Odeyinka, 2006, Ngi *et al.*, 2006, Idowu *et al.*, 2006, Fasae *et al.* 2007, Fasae *et al.* 2009). However, the HCN content varied within residues and diets which could be attributed to the chemical constituents in the diets as well as the effect of processing. The use of the processing methods has been reported to drastically reduce the cyanogenic potential of cassava product to safe levels (Fasae *et al.* 2009, Ukenye and Okafor, 2010). Concentrations of cyanogens in some other staple food items have been reported to be even higher than those in inadequately processed cassava and are therefore, potentially dangerous, although adverse health effects have not been reported.

The response of goats fed cassava residues based diets are shown in Table 5. Feed intake and weight gain by the goats (g/day) varied significantly ($P < 0.05$) among the dietary treatments. Goats on diets C performed best ($P < 0.05$) compared to the other treatments which could be attributed to higher CP content as a result of higher inclusion of cassava leaves in the diets. On the other hand, the low performance of goats on diets A and B reflects the varying inclusion levels of cassava peels and sieviate in the diets which have varying

levels of nutrient content. Higher levels of these residues in livestock diets have been reported to result into poor performance (Idowu *et al.*, 2006; Fasae *et al.*, 2007).

The feed intake (g/day) of goats in this experiment falls within the range reported for the same breed of goats fed fresh *Gliricidia* (Mba *et al.*, 1982) but lower than the range reported by Fasae *et al.*, (2006) and Ahamefule and Udo (2010) for the same breed of goats fed cassava leaves supplemented with *Gliricidia* and pigeon pea seed diets, respectively. Also, Ochepo *et al.* (2009) reported higher intake values for red Sokoto goats fed tiger nut meal supplemented with cassava peels. The difference in intake might be attributed to diet constituents and the breed of goat used. However, the weight gain (g/day) observed for goats in this study is higher than values reported by Fasae *et al.* (2007) for goats fed cassava peels supplemented with varying levels of palm kernel cake. This could be as a result of nutrient balancing due to the inclusion of cassava leaves and sieviate in the diets used in the present study. The weight range were however comparable to that reported by Nuru, (1985) for the same breed of goats in the first 12 months of life. Odeyinka *et al.* (2003) and Aderinboye and Onwuka (2010) also reported a similar weight range in their studies on WAD goats. However, there was no significant difference ($P > 0.05$) observed in the feed conversion ratio among the treatments

Table 4: Chemical composition (%) of the experimental diet fed to goats

Nutrient	Diet A	Diet B	Diet C	Diet D	Cassava peels	Cassava leaves	Cassava sieviate
Dry matter	87.18	89.35	88.76	90.22	89.03	90.28	90.89
Crude protein	10.82	13.87	17.01	11.75	5.41	20.50	2.12
Crude fibre	10.63	11.11	10.86	10.91	9.48	11.54	15.17
Ether extract	8.15	5.03	6.59	8.80	5.95	10.02	3.46
Ash	7.15	7.43	7.30	7.83	5.84	8.45	3.01
Hydrocyanic acid	19.61	17.08	22.55	-	18.99	22.35	15.78

Table 5: Dry matter intake, live weight changes, nutrient digestibility and haematological parameters of goats fed diets based on cassava residues and by-products.

Parameters	Diets				SEM
	A	B	C	D	
<u>Goat performance</u>					
Feed intake (g/day)	224.3 ^b	215.3 ^b	263.9 ^a	290.25 ^a	8.72
Weight gain (g/day)	30.02 ^b	30.71 ^b	37.85 ^a	36.50 ^a	3.11
Feed conversion ratio	7.47	7.00	6.97	7.94	0.92
<u>Digestibility (%)</u>					
Dry matter	64.48 ^b	65.94 ^b	70.35 ^a	69.94 ^a	3.92
Crude protein	69.28 ^b	75.24 ^{ab}	79.31 ^a	73.47 ^b	3.04
Crude fibre	53.79	56.35	53.28	48.54	2.49
Ether extract	53.52	51.12	57.42	57.91	2.85
Ash	58.37	52.92	59.06	51.29	2.78
<u>Haematological parameters</u>					
Packed cell volume (%)	22.47	23.61	24.64	22.91	1.88
Total protein (g/100ml)	6.72	7.02	7.20	6.12	0.33
Blood urea nitrogen (mmol/l)	3.20	3.54	3.82	2.91	0.61
Haemoglobin (g/dl)	6.75	7.33	7.11	6.87	0.29

a, b, c. Means on the same row with different superscripts differed significantly ($P < 0.05$)

indicating that the diets were equally utilized of the diets by the animals.

The percentage nutrient digestibility by the goats is shown in Table 4. Significant ($P < 0.05$) differences were observed among the treatments for DM and CP digestibilities with highest ($P < 0.05$) percentage observed in goats on diet C which is similar to those of the control diet. The CP digestibility increased ($P < 0.05$) with an increase in cassava leaves inclusion in the diets which could be as a result of the higher level of CP content of the diets. However, all the mixture of cassava residues fed to goats recorded DM and CP digestibility values comparable in literature to other feedstuff fed to goats (Odeyinka *et al.* 2003; Belewu and Fagbemi 2007; Olomola *et al.* 2008).

Haematological values for goats fed

varying proportions of cassava residues are also summarized in Table 4. There was no variation in the parameters monitored across the treatments. The values obtained fell within the normal physiological range reported for healthy goats (Daramola *et al.* 2005) suggesting that cassava residues had no negative effect on the experimental goats.

Conclusion

This study has shown that goats fed diet C consisting of 50% cassava leaves, 30% cassava peels and 20% cassava sieviate produced the best performance in terms of feed intake, digestibility and weight gain. This can therefore be recommended as best combination strategy in making use of cassava residues and by-products in goat feeding in Nigeria.

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