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Intake and digestibility of elephant grass ensiled with cassava peels by Red Sokoto goats

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Introduction

Goats provide a significant proportion of the meat and milk consumed in Nigeria (RIM, 1992). Their productivity is however limited by scarcity of forage during the dry season. This gap in feed supply can be filled by making silage from excess forage produced during the wet season (Wong, 2000). Elephant grass is a high yielding tropical grass with great potentials for making silage. Quality of this grass can improve with addition of a readily fermentable carbohydrate like cassava peel which is cheap and available in large quantities in Nigeria. The high starch content in cassava peel (Onua and Okeke, 1999) will also improve energy concentration in the tropical grass silage.

This study aimed at evaluating the physical and chemical attributes of elephant grass ensiled with different proportions of cassava peel, intake and nutritive value for Red Sokoto goats raised in the southwest of Nigeria during the dry season.

Materials and Methods

The study was carried out at the Dairy Unit of the Teaching and Research Farm, University of Ibadan, Ibadan. The diets which constitute the experimental treatments comprised of:

- Elephant grass alone (EG100)
- Elephant grass + 10% cassava peel (CSP10)
- Elephant grass + 30% cassava peel (CSP30)
- Elephant grass + 50% cassava peel (CSP50)

The grass was chopped to approximately 3 cm length using an automated grass chopper and mixed with chopped cassava peel in the proportions specified above. The mixtures were packed inside 120L plastic drums, compressed, weighted with a sand bag and covered with a plastic lid. Another set of silage was made inside 4L mini-silos for laboratory analysis. Samples of silage were taken from each mini-silo after 21 days for physical characteristics, pH and proximate composition. Silage in the plastic drums was used for the digestibility trial.

Twelve Red Sokoto goats (15.4 ± 1.2 kg) were placed inside individual pens with slated wooden floors adapted for faecal collection. Animals were offered experimental diets (silage) *ad libitum* for 21 days. Animals were adapted to pens and feed for 7 days while silage intake was measured in the last 14 days. Fresh water was offered free choice on a daily basis. Total faecal collection was done during the last 7 days and ten percent of faeces collected were taken for proximate analysis. Proximate composition of the feed and faeces were determined by the methods of AOAC (1995). The experimental design adopted in this study was the completely randomized design. Data obtained were subjected to analysis of variance and significant means were separated by Duncan's multiple range tests using the procedures of SAS (1995).

Results and Discussion

The physical characteristics and pH of silage mixtures prepared from elephant grass and cassava peels are presented in Table 1.

Table 1. Physical characteristics and pH of elephant grass and cassava peel silage at 21 days of ensiling

Parameter	EG100	CSP10	CSP30	CSP50
Appearance	Pale green	Pale green with little brown and white speckles	Light green with many brown and white speckles	Light green with many brown and white speckles
Smell	Pleasant	Pleasant	Pleasant	Very pleasant
Texture	Firm but slightly wet	Firm but slightly wet	Firm	Very firm
pH	4.70	4.56	4.10	3.75

EG100: elephant grass alone, CSP10: elephant grass + 10% cassava peel, CSP30: elephant grass + 30% cassava peel, CSP50: elephant grass + 50% cassava peel.

Silage with higher content of cassava peel (CSP30 and CSP50) had a lighter green colour than those with little or no cassava peel (EG100 and CSP10). All the silages prepared had a pleasant and acceptable smell; however, it appears that the smell improved with increasing level of cassava peel in the mixture. All the silages were firm in texture although those with little or no cassava peel were slightly wet when touched. The pH of the silages ranged from 3.75- 4.70. These were within acceptable range for good silage in the tropics (Bilal, 2009, Nhan et al., 2009). The pH of the ensiled mixtures reduced with increasing level of cassava peel inclusion, showing that addition of cassava peel was effective in improving fermentation characteristics of the tropical grass silage.

Proximate composition of the ensiled mixtures is shown in Table 2. DM content of the silage increased as the proportion of cassava peel in the mixture increased. Although crude protein content in elephant grass silage was slightly higher than those containing cassava peel, all silages had protein content lower than the minimum of 6 -

7 % required in ruminant diets for effective rumen function (Milford and Haydock, 1965), hence goats fed these basal diets will require protein supplementation. Crude fibre content of the silage mixtures reduced with increasing proportion of cassava peel in the silage while nitrogen free extracts (NFE) increased.

Table 2. Chemical composition of elephant grass and cassava peel silage

Parameter	EG100	CSP10	CSP30	CSP50
Dry matter	18.36	22.10	25.61	30.03
Crude protein	5.50	5.03	4.80	4.52
Ether extract	0.86	0.88	0.80	0.79
Crude fibre	35.00	34.00	30.80	29.50
Ash	7.5	8.00	8.80	8.90
Nitrogen free extract	51.14	51.55	54.80	56.29

EG100: elephant grass alone, CSP10: elephant grass + 10% cassava peel, CSP30: elephant grass + 30% cassava peel, CSP50: elephant grass + 50% cassava peel.

Dry matter intake and nutrient digestibility of silage by Red Sokoto goats are presented in Table 3. Silage intake increased with increasing level of cassava peel in the diet, showing that goats preferred silage with added cassava peel.

Table 3. Dry matter intake of Red Sokoto goats and nutrient digestibility of elephant grass ensiled with cassava peel

Parameters	EG100	CSP10	CSP30	CSP50	SEM
Forage intake (g/day)	239.04^{d}	265.07^{c}	305.83^{b}	357.55^{a}	5.26
Intake (% BW)	2.55^{c}	2.68^{bc}	2.92^{ab}	3.09^{a}	0.06
DM digestibility (%)	54.67^{b}	56.67^{b}	64.33^{a}	68.00^{a}	6.10
CP digestibility (%)	44.00^{b}	47.67^{b}	52.67^{ab}	59.00^{a}	5.93
CF digestibility (%)	54.00^{b}	54.67^{b}	62.33^{a}	63.67^{a}	5.61

^{abcd}means with different superscripts within the row are significantly different ($P< 0.05$)
BW: body weight, EG100: elephant grass alone, CSP10: elephant grass + 10% cassava peel, CSP30: elephant grass + 30% cassava peel, CSP50: elephant grass + 50% cassava peel.

Intake of goats in this study varied from 2.55 - 3.09 % of body weight. This falls within the range of 2.18 - 3.78 % reported by Olorunnisomo (2010) for sheep fed maize and amaranth fodders but lower than 3.3 – 3.8 % obtained for West African dwarf goats fed maize offal and sorghum brewer's grains in a total diet (Olorunnisomo and Ososanya, 2002). Backer et al., 1980 reported a mean DM intake of 2.37 % BW for cattle fed different mixtures of sweet potato forage and root.
DM digestibility of the diets varied significantly ($P< 0.05$) across the treatments with silages containing higher proportion of cassava peel in the mixture (CSP30 and CSP50) showing higher digestibility than those with little or no cassava peel (EG100 and CSP10). CP and CF digestibility followed the same general trend as DM digestibility. These results show that mixing elephant grass with cassava peel for ensiling improves nutrient digestibility of the mixed silage.

Conclusion and Outlook

Mixing cassava peel with elephant grass had beneficial effects on silage properties, intake and digestibility of the mixture. Where cassava peel is readily available, it is recommended that it forms at least 30% of silage made from elephant grass to improve productivity of goats in Nigeria during the dry season.

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