

CHEMICAL COMPOSITION AND NUTRIENT DIGESTIBILITY OF PELLETTED and ENSILED CASSAVA PEEL -*GLIRICIDIA SEPIUM* LEAVES FOR SOKOTO GUDALI CATTLE

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ABSTRACT

*This study investigated the chemical composition, acceptability, and nutrient digestibility of pelleted and ensiled feeds formulated from cassava peel (CSP) and *Gliricidia sepium* leaves (GL) for Sokoto Gudali cattle. Eighteen cattle were randomly divided into two groups: nine for pellet and nine for silage experiments, each further allocated to three treatments with three replicates. The treatments comprised CSP-GL mixtures at ratios of 75:25, 50:50, and 25:25. Feeds were offered using a cafeteria method to assess acceptability, after 15 days of adaptation and collection time, the most preferred silage and pellets were offered for comparison. Digestibility was evaluated over 14 days. Results revealed significant differences ($p < 0.05$) in dry matter (DM), crude protein (CP), and fiber fractions across diets. The 25:75 CSP-GL diet recorded the lowest DM content and highest fiber fraction, while the 75:25 CSP-GL silage had the highest Coefficient of Preference (CoP = 1.85). Pellet diets showed significant variations in CP, acid detergent fiber (ADF), neutral detergent fiber (NDF), and DM digestibility, with the 75:25 CSP-GL mixture achieving the highest digestibility values. In contrast, silage exhibited no significant differences in fiber fraction or CP digestibility. The 75:25 CSP-GL pellet also demonstrated the highest DM digestibility (92.92%). These findings indicate that pelletizing CSP and GL enhances nutrient utilization, making it a viable dry-season feed option for Sokoto Gudali cattle.*

Keywords: *Gliricidia sepium* leaves, Cassava peel, Sokoto Gudali cattle, Pellet, Silage

INTRODUCTION

In Nigeria, where pastoral systems dominate, weight loss in cattle due to inadequate dry-season nutrition remains a persistent challenge, undermining economic returns for livestock producers. Traditional approaches, such as silage production, help conserve wet-season forage surplus, yet limitations in nutrient retention, contamination risks, and storage inefficiencies necessitate alternative innovations (Olorunnisomo, 2011). Pelletized feed has emerged as a promising solution, offering enhanced shelf stability, reduced waste, and improved nutrient utilization advantages that could bridge seasonal feed gaps while supporting sustainable intensification of cattle production (Ogunkunle *et al.*, 2020).

Nigeria's agro-ecological conditions favor the abundance of two underutilized resources: cassava (*Manihot esculenta*) peel, a starch-rich byproduct of cassava processing, and *Gliricidia sepium*, a leguminous shrub with high protein content. Despite their year-round availability, cassava peel is often discarded as waste, while *Gliricidia* is primarily used for soil improvement rather than feed, representing missed opportunities for nutrient recycling (Ogunkunle *et al.*, 2020). Strategic integration of these resources into ruminant diets could address dry-season protein-energy deficits, yet their combined efficacy remains underexplored, particularly in processed forms like pellets and silage.

The aim of this study was therefore to evaluate the chemical composition, acceptability, and nutrient digestibility of pelleted and ensiled cassava peel-*Gliricidia sepium* leaf diet for Sokoto Gudali cattle.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the Dairy Unit of the Teaching and Research Farm (TRF), University of Ibadan, Ibadan, Nigeria (3°45 E, 7°27 N; at 220m above sea level).

Experimental Procedure

Fresh cassava peel was purchased from a reputable cassava processing factory in Ibadan while *Gliricidia sepium* leaves were harvested from an established paddock at the dairy unit of the teaching and research farm of the university of Ibadan. The materials were processed to produce six experimental diets, comprising three pellet and three silage formulations with varying ratios of cassava peel (CSP) to *Gliricidia sepium* leaves (GL): 75:25, 50:50, and 25:75 (Table 1). Eighteen Sokoto Gudali cattle were selected at random from the available herd at the University of Ibadan's teaching and research farm; nine were randomly assigned to treatments and replicates for pellet feeding, while the remaining nine were randomly allocated to the silage experiment. In the acceptability study, the cafeteria approach was used; the animals were placed in an open fenced area with no additional feed except the experimental diets. 10kg of each experimental diets were weighed in wooden feeding troughs and placed strategically throughout the enclosure; the troughs were repositioned daily to prevent positional bias. The

cattle were offered pellets for 30 minutes per day, followed by silage for 30 minutes per day, for 15 days, with a 10-day adjustment phase and a 5-day collecting time. At the end of the 5-day collection period, the most preferred pellet and silage were offered for additional 5 days for acceptability comparison. The feeds were available for 30 minutes every day, and the CoP and %Pp were determined. The digestibility study was conducted over 14 days, with a 7-day adaptation period followed by a 7-day data collection phase. Feed intake, feed refusal, and faecal output were measured daily. Samples of feed and faeces were collected, oven-dried at 65°C, and stored in airtight containers for subsequent analysis.

The experiment followed a completely randomized design. All data collected were subjected to statistical analysis of variance, using statistical analytical system (SAS, 2008). Treatment mean was separated using Duncan multiple range test

Table 1: Composition of experimental diets

Feed Ingredients (%)	Pellet			Silage		
	T1	T2	T3	T4	T5	T6
Cassava Peel	75.00	50.00	25.00	75.00	50.00	25.00
<i>Gliricidia sepium</i> leaves	25.00	50.00	75.00	25.00	50.00	75.00
Total	100.00	100.00	100.00	100.00	100.00	100.00

RESULTS AND DISCUSSION

The chemical composition of the experimental diets is presented in Table 2. There was significant difference ($p < 0.05$) in Dry matter (DM) content of the diets. The % DM ranged from 91.43 to 86.67 for pellet while %DM for silage ranged from 28.67 to 26.27. The dry matter content obtained in this research were in accordance with the results of Adelusi *et al.*, 2022 and Ogunkunle *et al.*, 2020, who recorded a decrease in dry matter value as leaf meal inclusion level increased. Although significant difference ($p < 0.05$) was also observed in the Crude protein (CP) across the treatments, The CP (9.18 – 12.02) reported in this study were above the minimum requirement of 8% suggested by Norton, (1994) to meet ammonia level requirement and ensure sufficient utilization of feed by ruminants. The fiber fraction of the feed increases as the level of *Gliricidia sepium* leaves increased in the diets; this could be attributed to the leaves' higher lignin content when harvested during the dry season (Adelusi *et al.*, 2022).

Table 2: Chemical composition of pellet and silage made from Cassava (*Manihot esculentus*) peel and *Gliricidia sepium* leaves

Nutrients (%)	T1	T2	T3	T4	T5	T6	SEM
Dry Matter	91.43 ^a	90.47 ^a	86.67 ^b	28.67 ^c	28.53 ^c	26.27 ^c	0.07
Crude Protein	11.84 ^a	10.11 ^{bc}	12.02 ^a	9.80 ^c	10.27 ^b	9.18 ^d	0.01
Neutral Detergent fiber	53.51 ^c	55.31 ^d	55.63 ^d	57.12 ^c	58.80 ^b	61.22 ^a	0.02
Acid Detergent Fiber	38.37 ^c	40.37 ^d	41.63 ^c	43.27 ^b	43.78 ^b	45.87 ^a	0.02
Acid Detergent Lignin	15.34 ^c	16.26 ^d	16.70 ^d	17.69 ^c	19.11 ^b	20.33 ^a	0.02

Sa, b, bc, c, d, e; Mean with the same superscript are not significantly different

SEM = Standard error of mean

Table 3: Acceptability of pellet and silage made from Cassava (*Manihot esculentus*) peels and *Gliricidia sepium* leaves

	T1	T2	SEM
CoP	0.15 ^b	1.85 ^a	0.00
%Pp	7.65 ^b	92.36 ^a	0.05

a,b,c,d,e; Mean with the same superscript are not significantly different

T1= 75% cassava peel + 25% *Gliricidia sepium* leaves (pellet), T2= 75% cassava peel + 25% *Gliricidia sepium* leaves (silage). CoP = Coefficient of Preference, %Pp = Percentage preference.

The acceptability study revealed that the 75:25 CSP-GL silage formulation was the most preferred, with a Coefficient of Preference (CoP) of 1.85 and a percentage preference (%Pp) of 92.36% (Table 3). This preference may be attributed to the cattle's familiarity with wet feeds, as supported by previous studies (Ikhimioya, 2008; Obour *et al.*, 2015).

Table 4 shows the digestibility of pellet and silage produced from cassava peels and *Gliricidia sepium* leaves. The dry matter digestibility differs across treatments, with T1 and T4 having higher value of 92.92 and 92.82 respectively. There was significant difference ($p < 0.05$) in the %NDF, %ADF and %ADL for pellet diet. The DMD obtained in this study is considered high, this could be because of the high level of protein in the diet. This result conforms with the findings of Ibhaeze *et al.*, (2014) that increase in protein level in a diet will improve microbial protein synthesis, enhance fermentation and digestibility of the diet.

Table 4: Digestibility of pellet and silage made from Cassava (*Manihot esculentus*) peels and *Gliricidia sepium* leaves

Nurient (%)	T1	T2	T3	T4	T5	T6	SEM
DMD	92.92 ^a	90.81 ^b	91.14 ^b	92.82 ^a	91.73 ^{ab}	91.58 ^{ab}	0.01
CP	83.40 ^b	65.31 ^d	69.27 ^c	86.79 ^a	88.24 ^a	87.71 ^a	0.06
NDF	72.03 ^b	54.66 ^c	57.51 ^c	88.69 ^a	88.70 ^a	88.47 ^a	0.08
ADF	69.74 ^b	52.82 ^d	59.27 ^c	87.88 ^a	88.38 ^a	87.51 ^a	0.11
ADL	69.03 ^b	52.60 ^c	55.49 ^c	87.57 ^a	88.01 ^a	88.92 ^a	0.08

a, b, ab, c, d; Mean with the same superscript are not significantly different

DMD= Dry Matter Digestibility, CP= Crude Protein, NDF= Neutral Detergent Fiber, ADF= Acid Detergent Fiber, ADL= Acid Detergent Lignin

CONCLUSION

The result of this experiment showed that cassava peel and *Gliricidia sepium* leaves can be effectively utilized to formulate pellets and silage for Sokoto Gudali cattle, particularly during the dry season. Pellet and silage containing cassava peel and *Gliricidia sepium* leaves in ratio 75:25 is more digestible and acceptable by Sokoto Gudali cattle.

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