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Feed intake and digestibility in Yankasa sheep fed diets containing varying levels of *Leucaena leucocephala* leaf residues

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Abstract

Four Yankasa sheep, weighing between 19 and 24kg live weight and with age range between 15-24 months were used in a metabolism study to determine the intake and digestibility of Leuceana leucocephala leaf residue (LLLR) based diets. The animals were placed on four diets A, B, C and D. Diet A served as control with 0% LLLR while diets B, C and D had 15, 30 and 45% LLLR inclusion, respectively.Dry matter and dietary crude protein intake by the experimental animals decreased with increasing level of LLLR inclusion in the diets, although these values were not significant (P>0.05). Also, digestion rates for dry matter and the nutrients decreased as protein level of the diets decreased but the variation were not significant (P>0.05). Inclusion of 15% LLLR in the diet produced the best weight gain, though this was not significantly (P>0.05) different from other treatments. None of the animals developed any health problem and none was underfed as they all recorded an increase in weight. The diet with 15% LLLR produced performance similar to the control both in nutrient intake and weight gain.

Keywords: *Leucaena leucocephala*, Yankasa Sheep, Nutrient intake, Digestibility

Introduction

Dry season feeding of livestock especially ruminants in the tropics has always been a problem to farmers since very little good pasture exists during this period. At this time, the performance of these animals are seriously impaired and one possible way to alleviate this problem and hence maintain production in the tropics is to feed them crop residues which in other words may be an alternative feed for ruminants since it cannot be consumed by man, but can be converted by ruminants into desirable human feed. This therefore reduces the total cost of animal production with out a decrease in productivity and also maintains efficient feed utilization.

Leucaena leucocephala, a browse plant has great potential as source of high quality nutrients for ruminants, being high in protein, minerals and vitamins. They also have the ability of being available all year round because of their drought resistance, persistence, vigorous growth, re-growth and palatability (Reynolds and Atta- Krah,

1986).The whole leaf of *Leucaena leucocephala* contains both nutrients and roughage and makes a more or less complete ruminant feed. It is very rich in protein and several studies have been conducted on its utilization and toxicity (Odeyinka, 1999 and Hammond, 1995).

Leucaena leucocephala leaf residues (LLLR) are fibrous residues left after the extraction of protein concentrate from leucaena leaves. They have been reported to contain 45 – 55% of fresh leaves (wet weight basis) and have been used as silage for ruminant feed in dry season when fodder vegetation is scarce (Fellows, 1987). This study was therefore conducted to investigate the effect of feeding *Leucaena leucocephala* leaf residues (LLLR) on the performance of Yankasa sheep.

Materials and Methods

Animal management

The experiment was carried out at the Teaching and Research Farm of the Federal University of Technology, Akure. It involved 4 Yankasa sheep weighing between 19-24kg, aged15-24 months, in a 4x4 Latin square experiment to assess the intake and digestibility of nutrients by the animals. The animals were housed in individual pens with feed and water supplied daily. Prior to the experiment, the animals were dewormed and given prophylactic treatment of Terramycin long acting antibiotics.

Diets

Fresh leaves of *Leucaena leucocephala* were harvested and processed. The harvested leaves were weighed and pulped by means of a modified hammer mill to rupture the plants cell walls, after which the juice was removed by pressing through a twin squeeze presser. The leftover residues were then sun- dried for some days before grinding. The ground residues was used in compounding the four diets containing *Leucaena leucocephala* leaf residue (LLLR) at the rate of 0, 15, 30 and 45% for diets A, B, C, and D respectively. Rice bran was added in percentage of 65, 50, 35 and 20% while maize offals, salt and urea were fixed at 33, 0.5 and 1.5% respectively.

The experiment involved an initial adjustment period of 14 days to allow the animals adjust to confinement and the diets, followed by a collecting period of 7 days. Feeds were offered *ad-libitum*, and daily refusals measured to determine intake. Initial body weights of the animals were taken at the beginning of the study and subsequent body weight changes also taken to coincide with the change to a new regime. Total daily feacal output was also measured for each animal and 10% sample taken and dried to constant weight in a hot dry oven at 105^{0}C to determine the moisture content.

Analytical procedures

The nitrogen content of feeds and feaces were determined using Kjeldhal method. Ground feeds and feaces were analysed for crude fibre, ether extract and ash as described by AOAC (1990). Results obtained were used for calculation of digestibility of nutrients for the experimental animals. Data obtained were subjected to analysis of variance by method of Snedecor and Cochran (1986). Significant means were separated by Duncan (1955) multiple range test.

Results and Discussion

The chemical composition the experimental diets are shown in Table 1. The LLLR used in the study contained DM, CP, CF, EE, Ash and NFE values of 91.05, 2.5, 24.22,3.11, 7.77 and 62.4 % respectively. The value of the crude fibre was higher while crude protein values was lower than values reported by Stewart (1996) with a similar work. Soil and climate perhaps processing methods may have been responsible for the differences. The values of CP varied slightly across the diets ranging from 12.11% (Diet D) to 13.04% (Diet A). The little variations in other nutrients especially NFE

Table 1: Chemical composition of experimental diets (%) on dry matter basis

	Diet A 0% LLLR	Diet B 15%LLLR	Diet C 30%LLLR	Diet D 45%LLLR	LLLR
Dry matter	85.10	84.30	82.90	81.30	91.05
Crude protein	13.04	12.90	12.54	12.11	2.50
Crude fibre	23.61	22.59	21.13	20.71	24.22
Ash	36.48	28.30	29.46	30.39	7.77
Ether extract	12.19	11.62	10.72	9.90	3.11
Nitrogen free extract	14.68	24.59	26.15	26.89	62.40

LLLR - *Leucaena leucocephala* leaf residue

Table 2: Mean intake of DM, other feed nutrients (g/ day) and weight changes of Yankasa sheep fed LLLR based diet.

Parameters	DIETS			
	A	B	C	D
Dry matter	1394.38±76.17	1315.03±96.60	1278.74±75.18	1174.38±75.58
Crude protein	181.83±11.64	169.46±14.88	160.35±19.63	142.21±4.38
Crude fibre	329.21±21.09	297.07±26.06	270.20±30.49	243.20±14.60
Ether extract	169.97±10.88	152.81±13.40	137.08±16.78	116.26±11.76
N. free extract	204.69±13.11[a]	323.37±28.37[bc]	334.39±20.93[ab]	315.78±11.95[ab]
Initial weight (kg)	23.22±1.07	20.65±0.93	23.80±0.29	19.14±0.70
Final weight (kg)	24.22±1.97	21.88±2.22	24.44±0.96	19.76±0.69
Weight changes (kg)	0.90±0.72	1.23±1.29	0.64±0.01	0.62±0.07

[a,b,c] *Values on the same row with identical superscripts are not significantly different (P >0.05)*.

and CF were due to the nutrient composition of other ingredients used aside LLLR in compounding the diets. The replacement of rice husk with LLLR however led to a reduction in EE of the diets. This could be attributed to the percentage of these nutrients in the chemical composition (Preston, 1982).

The data on dry matter and nutrient intake by the

experimental animals are summarized in Table 2. Dry matter consumption by the experimental animals decreased with decreasing level of LLLR in the corresponding diets although the trends were not significant ($P > 0.05$). This could be attributed to the palatable nature of the diets which invariably affects the amount of the feed intake (FAO, 1981).

The average CF intake in this study was observed to decrease progressively for animals on diets A (56.97± 5.67) to D (42.51± 2.51) as the level of LLLR in the diet increased which does not agree with the findings of Ademosun *et al* (1994) and Odeyinka (1999) who reported that CF intake level increases with the level of *Leucaena leucocephala* in the diet of West Africa Dwarf goats. This variation may however be attributed to the leaf residue used in the diets.

The apparent nutrient digestibility coefficients of the diets are summarized in Table 3. Variations observed among the treatments for digestibilities coefficient of DM, CF, CP, EE, ASH, NFE were not significant ($P > 0.05$). The DM digestibility values for the diets in the study were relatively low suggesting that the diets were not highly digested. This digestibility coefficient is comparable to those of Adeneye and Sunmonu (1994) who fed forage supplemented with concentrate to goats and sheep respectively. The digestibility coefficient of CP and CF were higher for animals on diet A than those of the other three diets. Animals on diet C had the highest digestibility coefficient value (45.04± 4.45) for DM with animals on diet D having the lowest DM digestibility (39.82± 9.39), although the differences were not significant.

The CP and CF digestibility were lower than those reported by Getachew (1994) for sheep on a maize stover supplemented with legume hay. The difference could be due to the type of concentrate used and the various types of supplement used in the diets. Digestibility of CF may be linked with the level of CP in the study. The CF digestibility decreases with decreasing level of CP level in the diets. Similar observations were also reported by Ash (1990).

The decreasing CF levels of the diets A to D apparently fail to alter the digestibility of DM, CP and NFE to any significant degrees. This agrees with the findings of Okamato and Yoshida (1983) and Woodford *et al* (1986) who reported non significant differences in digestibilities of these nutrients with varying dietary fibre levels. The digestibility coefficient of EE in the diets A, B, C and D varied slightly, this might be due to the animal factor as reported by Mc Donald *et al*

Table 3: Apparent nutrient digestibility coefficient (%) of experimental diets

Parameters	DIETS			
	A	B	C	D
Dry matter	42.56±5.84	40.52± 6.05	45.04 ± 4.45	39.82±9.39
Crude protein	54.72±4.92	53.72±4.12	47.29±4.59	45.73±3.91
Crude fibre	56.97± 5.67	52.39±1.69	42.12± 2.56	42.51± 2.51
Ether extract	54.04± 9.39	55.69±4.09	45.94± 4.09	44.80± 5.54
Ash	42.65± 4.25	36.89±3:81	27.41± 5.60	33.86± 6.25
Nitrogen free extract	48.64± 16.79	35.88±7.02	23.71±9.82	26.28±3.16

(1982) and Aderinola (1996). Table 2 shows that animals on diet D (45% LLLR) had the lowest weight gain (0.62± 0.07) while animals on diet B (15% LLLR) had the highest mean live weight gain (1.23± 1.29) kg. 15% LLLR produced performance similar to the control both in nutrient intake and weight gain.

Conclusion

Results obtained in the study showed that utilization of *Leucaena leucocephala* leaf residue (LLLR), a low quality roughage is enhanced by adequate protein supplementation. It could be recommended that a level of 15% LLLR can be incorporated into the diet of sheep for optimum performance. Thus, *Leucaena leucocephala* leaf residue which had always been allowed to rot away can contribute meaningfully to the feeding of sheep.

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