

EFFECTS OF *Cajanus cajan* LEAF MEAL IN TOTAL MIXED RATIONS ON NITROGEN UTILIZATION OF WEST AFRICAN DWARF RAMS FED *Panicum maximum*

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ABSTRACT

This study was conducted to assess the nitrogen utilization of WAD growing rams fed diets containing *Cajanus cajan* leaf meal (CCLM) at varied inclusion levels of 0%, 5%, 10%, and 15% as supplement feed. Sixteen (16) West African Dwarf rams aged between 6 - 9 months with an average body weight of 9.00 - 12.00kg were used in assessing the nitrogen utilization value of growing rams fed varying levels of *Cajanus cajan* leaf meal to replace palm kernel cake as a protein source in total mixed rations fed *Panicum maximum* basal diet for 56days feeding trial in Completely Randomized Design (CRD). Parameters taken at the end of the experiment were faecal and urine to determine nitrogen intake, faecal nitrogen, urinary nitrogen, and nitrogen utilization for each treatment. Rams fed on diet T₁ had the highest significant ($p < 0.05$) difference of nitrogen intake (50.01g/d), while the lowest value for nitrogen intake was recorded in diet T₂ (45.22g/d). Nitrogen utilization increased significantly ($p < 0.05$) from 69.50 (T₂) to 70.78.04 (T₃). Rams fed diet T₂ had the lowest nitrogen balance (31.43g/d) and the highest value (37.34g/d) was recorded in the T₃ diet. Rams fed diet T₂ had the highest faecal nitrogen value (12.14g/d). However, the animals fed the T₁ diet had the highest value (2.08g/d) of urinary nitrogen. Results obtained showed that *Cajanus cajan* leaf meal at 10% inclusion levels in the concentrate diet enhanced the nitrogen utilization without any deleterious effects on the growing rams.

Keywords: Tropical grass, *Cajanus cajan* leaf meal, WAD rams, Nitrogen utilization.

INTRODUCTION

Ruminant production is vital in supplying man's protein requirement and in sustaining these animals as well as improving their production; they require quality feed and adequate management. Feed as reported by Akpodiete and Inoni (2000) accounts for 60 – 70% of the total cost of livestock production and its inadequacy in quality and quantity could lead to a situation of low nutritional status, poor weight gain, poor reproductive ability, poor production, poor health condition and poor conversion ratio (Fajemisin *et al.*, 2015). The feeds and feedstuffs that are available for ruminants during the dry season in Nigeria are low in quality and have been described to be fibrous, resulting in low digestibility and poor livestock productivity (Adeyemo, 2010). In Nigeria, the usual practice is to supplement the livestock diets with protein-rich ingredients such as groundnut cake (GNC), soybean meal (SBM), and cottonseed cake (CSC). These ingredients are becoming scarce and expensive because of various competitive uses for them. A cheaper alternative of enhancing utilization of low-quality grass is by supplementation with high nitrogen multipurpose browse plants such as *Cajanus cajan* forage. In Nigeria and many other tropical and subtropical countries, there abound many plants with widespread acceptance and utilization scientifically for improving the health status and performance of animals (Onu, 2012). Tropical browse plants such as Pigeon pea (*Cajanus cajan*) is the multipurpose nitrogen-fixing crop that provides the seed as human food and poultry feed, the leaves and young stems as animal fodder for the subsistence farmers (Lorgyer, 2009). To address the nutritional need of sheep, it is, therefore, important to argue the nutrition of West African Dwarf growing rams with concentrate formulations based on locally available and non-competitive feedstuffs. This study was, therefore, designed to evaluate the nitrogen utilization of WAD growing rams fed *Cajanus cajan* leaf meal diets.

MATERIALS AND METHODS

Experimental site and animals

The experiment was carried out at the Sheep and Goat Unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora. Sixteen (16) growing West African Dwarf rams weighing between 9.00 - 12.00kg and of 6 – 9 months of age were used. The animals were acclimatized for three weeks and treated against ectoparasites and endoparasites before the commencement of the experiment.

Harvesting, processing, and preparation of experimental diets

The forages were harvested from the pasture demonstration plot of the college farm. *Cajanus cajan* leaves and *Panicum maximum* were cut at a height of 30cm above the ground level at 50% flowering stage to allow for good re-growth. *Cajanus cajan* leaves including twigs and petioles were harvested and air-dried to constant weight at room temperature while retaining their greenish colouration. The forage was then milled to pass through a 2mm sieve. The *Cajanus cajan* leaf meal was stored at room temperature in jute bags until needed for inclusion in the commercial supplement. Four experimental diets (Table 1) were formulated by replacing palm kernel cake and corn bran with *Cajanus cajan* leaf meal (CCLM), and their chemical composition is presented in Table 2.

Experimental layout, design, and feeding method

The animals were allocated by weight into four treatments of four rams per treatment and two animals as replicate in a Completely Randomized Design (CRD). The treatments consisted of four total mixed diets containing CCLM at 0, 5, 10, and 15% inclusion levels. The rams were fed on a basal diet of *Panicum maximum* in the morning (0800hr), while the experimental supplements were offered in the afternoon (1500hr). Each group of animals was assigned to an experimental diet and fresh clean water was made available.

Data collection and analysis

Urine and feces were collected separately from each animal daily throughout the last seven days of the experiment in metabolic cages. The faeces sample collected were oven-dried at 80°C until a constant weight was reached. The urinary output was collected in sample bottles with a plastic cover containing 20% dilute tetraoxosulphate (IV) acid and stored at -20°C for analysis. The faecal samples were chemically analyzed using the A.O.A.C procedure (AOAC, 1995). All nutrient digestibility data obtained were subject to one-way analysis of variance (SAS, 1999). Differences among the means were separate using Duncan's multiple range test (Duncan, 1955).

Table 1: Gross composition of experimental diets (%)

Ingredients	T ₁	T ₂	T ₃	T ₄
CCLM	0.00	5.00	10.00	15.00
Wheat offal	28.00	28.00	28.00	28.00
Corn bran	51.00	48.00	45.00	42.00
PKC	18.00	16.00	14.00	12.00
Bone meal	2.25	2.25	2.25	2.25
Salt	0.50	0.50	0.50	0.50
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated				
Analysis				
CP	13.33	13.59	13.85	14.11
M.E (MJ/KgDM)	11.17	8.47	8.45	8.43

CCLM= *Cajanus cajan* leaf meal, PKC= Palm kernel cake, CP= Crude protein, and ME= Metabolizable energy

RESULTS AND DISCUSSION

Nitrogen utilization of WAD growing rams fed diets containing varying levels of CCLM is presented in Table 3. The nitrogen intakes of the control (T₁) and the 15% CCLM (T₄) groups were ($p < 0.05$) greater compared to the nitrogen intakes of 5% (T₂) and 10% (T₃) CCLM groups. There were significant differences ($p < 0.05$) in the urinary nitrogen excretion among the treatments. The T₁ faecal nitrogen was significantly ($p > 0.05$) relative to that of T₄ diet. Nitrogen balance did not follow a particular pattern, it fluctuated with the increasing level of CCLM, with T₁ and T₂ diets having the lowest values. The observed lower nitrogen balance and nitrogen utilization may be due to increased tannins effect in CCLM as inclusion level increased. Tannins have been reported to have a pronounced effect on nitrogen utilization on the fed tannin-rich fodders (Olafadehan, 2013). The

higher nitrogen balance value (37.34g/d) of the 10% CCLM (T₃) diet is indicative of the fact that the diet promoted better nitrogen utilization. It appears the tannin level of the 10% CCLM (T₃) diet was more beneficial than the tannin concentrations of the control (T₁) diet and lower levels of the 5% CCLM (T₂) diet. All the diets showed positive nitrogen balance, which indicates that the protein requirements for maintenance in the experimental animals were satisfactorily met by the dietary treatments. The percentage of nitrogen utilization recorded in this study ranged between (69.50 to 78.04 %) which fell within the range of 17 to 79% reported by Okoruwa and Adewumi (2010) for West African Dwarf sheep fed *Panicum maximum* with dried pineapple pulp. These observed values might also be attributed to feeding intake, protein quality, and digestibility of the diet. The results imply that rams can tolerate up to 15% CCLM inclusion level without any negative effect on their growth performance.

Table 2: Chemical composition of the experimental diets and *Panicum maximum* (%)

Parameters	T ₁	T ₂	T ₃	T ₄	<i>Panicum maximum</i>
Dry matter	94.68	94.23	93.05	92.75	89.67
Crude protein	15.27	16.82	17.02	18.10	7.30
Crude fiber	8.75	9.12	9.86	10.16	22.20
Nitrogen free Extract	60.21	58.79	54.67	52.56	66.00
Ether extract	4.32	3.86	4.68	4.91	2.90
Ash	6.13	5.64	6.79	7.02	3.30

Table 3: Nitrogen Utilization of West African Dwarf Growing Rams fed *Cajanus cajan* leaf meal total mixed rations and *Panicum maximum* basal diet

Parameters	T ₁	T ₂	T ₃	T ₄	SEM±
Nitrogen intake (g/d)	50.01 ^a	45.22 ^d	47.85 ^c	49.18 ^b	0.35
Faecal nitrogen (g/d)	11.67 ^b	12.14 ^a	9.36 ^d	11.60 ^c	0.05
Urinary nitrogen (g/d)	2.08 ^a	1.65 ^b	1.15 ^c	1.21 ^d	0.16
Total N output (g/d)	13.75 ^b	13.79 ^a	10.51 ^d	12.81 ^c	0.21
Nitrogen balance (g/d)	36.26 ^c	31.43 ^d	37.34 ^a	36.37 ^b	0.13
Nitrogen utilization (%)	72.51 ^c	69.50 ^d	78.04 ^a	73.95 ^b	4.12

^{a b c d e} means on the same row with different superscript are significantly different ($P < 0.05$).

CONCLUSION

The inclusion of *Cajanus cajan* leaf meal in the diets was favourable, acceptable, and tolerable to the rams. The result obtained showed that the *Cajanus cajan* leaf meal is a good source of protein and energy at a 10% inclusion level of the leaves in the concentrate diet.

RECOMMENDATION

Based on the result of this research, it could be recommended that *Cajanus cajan* leaf meal could be incorporated into the diet of WAD growing rams at a 10% inclusion level in terms of nitrogen utilization as a supplement for growing rams to alleviate the nutrient requirement and body weight losses that are usually experienced during the dry season period.

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