

**NSAP****47th Annual
Conference
(JOS 2022)****CONFERENCE
PROCEEDINGS**THEME
**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES****EVALUATION OF SELECTED SERUM MACRO MINERALS IN WEST AFRICAN DWARF
RAMS FED *Cajanus cajan* MEAL IN TOTAL MIXED RATION****Adebisi, I.A., Ajibike, A.B., Okunlola, O.O., Oladebo, O., Amusa, H.O. and Alalade, J.A.** Department of Animal Production Technology, Faculty of Animal and Fisheries Technology, Oyo State College of Agriculture and Technology, PMB 10, Igboora, Oyo State, Nigeria

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ABSTRACT

*This study was conducted to evaluate selected serum macro-minerals in West African Dwarf (WAD) rams fed diets containing *Cajanus cajan* leaf meal (CCLM) at varied inclusion levels of 0% (T_1), 5% (T_2), 10% (T_3), and 15% (T_4) as supplement feed to replace palm kernel cake as protein source in total mixed rations with *Panicum maximum* as basal diet. Sixteen (16) WAD rams of age 6 - 9 months with body weight of 9.00 - 12.00 kg were used in a completely randomized design for 56 days feeding trial. Two rams per treatment were selected and blood was collected for analysis at the end of the feeding trial. The result revealed significant difference ($p < 0.05$) for calcium, potassium, phosphorus and sodium across the dietary treatments. The highest calcium value was observed in T_2 (12.39 mg/dl) with T_4 having the lowest value of 11.32 mg/dl. Rams fed T_4 diet (15% CCLM) with *Panicum maximum* mixture had the highest potassium value (5.66 mg/dl) while those fed T_1 had the lowest value of 3.16 mg/dl. It was observed that rams fed T_1 (0% CCLM inclusion) had the highest phosphorus and sodium value of 5.10 mg/dl and 179.79 mg/dl respectively, while the lowest phosphorus and sodium value of 1.91 mg/dl and 116.36 mg/dl was recorded in the T_3 respectively. It can be concluded that *Cajanus cajan* leaf meal could be fed to growing rams up to 15% inclusion level without any deleterious effects in serum macro-minerals concentration of growing rams.*

Key words: *Cajanus cajan* leaf meal, *Panicum maximum*, Serum macro-minerals, WAD rams.**INTRODUCTION**

Ruminant animal requires quality feed and good management system in sustaining and improving their production towards meeting human's protein requirement. Feed accounts for 60 – 70% of the total cost of livestock production, and its inadequacy in quality and quantity could cause low nutritional status, poor weight gain, poor reproductive ability, poor production, poor health condition and poor conversion ratio (Fajemisin *et al.*, 2015; Akpodiete and Inoni, 2000). Minerals perform essential functions in animals including structural, physiological, catalytic and regulatory roles (Suttle, 2010), and are generally obtained via feed components as well as from water (NRC, 2007). In Nigeria, livestock diets are supplemented with protein-rich ingredients such as groundnut cake (GNC), soybean meal (SBM), and cottonseed cake (CSC) which are becoming scarce and expensive due to their competitive use and consumption. A cheaper alternative of enhancing utilization of low-quality grass is by supplementation with high nitrogen multipurpose browse plants such as *Cajanus cajan* forage. 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 selected serum macro minerals of WAD growing rams fed *Cajanus cajan* leaf meal diets.



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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 of 6 – 9 months old were used. The animals were acclimatized for three weeks and treated for 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. *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 regrowth. *Cajanus cajan* leaves with the twigs and petioles were air-dried to constant weight at room temperature to retain their greenish colouration, then milled to pass through a 2mm sieve before stored in jute bags until needed. Four experimental diets (Table 1) were formulated by replacing palm kernel cake and corn bran with *Cajanus cajan* leaf meal (CCLM), with their chemical composition as shown 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. Each group of animals were fed *Panicum maximum* as basal diet in the morning (0800hr) while the experimental diets were offered at 1500hr, and fresh and clean water was provided *ad libitum*

Blood collection for mineral analysis

At the end of day 56 of feed trial, 5ml of blood sample was collected via the jugular vein of two rams per treatment using new hypodermic needle and syringe for each animal to avoid cross-contamination into plain bottles for selected macro-minerals determination. Calcium and magnesium were determined using Atomic Absorption Spectrophotometer (Buck Scientific Model 210 VGP) while sodium and potassium were determined using Flame Photometer. Data obtained were subjected to one-way analysis of variance using Statistical Analysis System (SAS, 2019), and differences among the means were separated 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	11.17	8.47	8.45	8.43
(MJ/KgDM)				

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



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

RESULTS AND DISCUSSION

Selected serum macro-minerals of WAD rams fed diets containing varying levels of CCLM was evaluated and presented in Table 3. There was significant ($p < 0.05$) difference in the Ca concentration across dietary treatments with T₂ and T₄ having the highest and lowest value of 12.39mg/dl and 11.32mg/dl, respectively. Our observed value conforms with the values of 9 - 12mg/dl and 11.0 - 12.4 mg/dl reported by Underwood and Suttle (1999) and Kaneko (1989), respectively as the required Ca concentration in serum for a healthy sheep but, it is higher than 9.3 - 11.7mg/dl reported by Latimer *et al.* (2003) as the normal Ca range in serum for sheep. The Ca concentration in all treatment groups were slightly below moderate hyper-calcium level of 12 - 15mg/dl stated by Littledike *et al.* (1976) which is believed to cause calcification of soft tissues and lower feed intake. The results of serum potassium concentration for all treatments were below the normal range of 15.20 to 21.06mg/dl suggested by Jackson (2002), which could be due to low K concentration in diets. The obtained Phosphorus values range between 1.91 - 5.10 mg/dl fell below 4 - 8mg/dl as the normal range of Phosphorous (P) in serum of sheep as recommended by Latimer *et al.* (2003). The Na concentration in treatment groups were within the recommended range of 142.00 - 160.00mg/dl by Latimer *et al.* (2003), but were lower than the reported values of 326.60-345.00mg/dl in sheep by Jackson (2002). This variation could be due to bioavailability and interaction of Na in the used feed and genetic difference of the animals (McDowell, 2003). The Mg concentration recorded in T₁ (0.38mg/dl) was numerically higher than other treatments, with no significant ($p > 0.05$) different across treatment groups, and fell below 1.0 - 2.0mg/dl described as a critical level by McDowell (2003), and normal range of 2.0 - 2.7mg/dl reported by Latimer *et al.* (2003). However, the observed Mg concentration is below toxic level (> 6 ppm) reported to cause diarrhoea in sheep (NRC, 2005) as well as other problems for livestock especially those with high nutritional demands such as rapidly growing weaners, pregnant or lactating ewes (Mayberry *et al.*, 2010). The lower value of Mg in rams across dietary treatments is related to high K concentration as it has been well established that high dietary potassium interferes with magnesium absorption in ruminant animals (McDowell, 1985).

Table 3: Selected serum macro minerals 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 ($\pm$)
Ca (mg/dl)	11.68 ^b	12.39 ^a	11.56 ^b	11.32 ^c	0.20
K(mg/dl)	3.16 ^b	3.32 ^b	5.26 ^a	5.66 ^a	2.61
P(mg/dl)	5.10 ^a	2.30 ^c	1.91 ^d	3.90 ^b	2.53
Na (mg/dl)	179.79 ^a	146.50 ^c	116.36 ^d	161.92 ^b	11.64
Mg (mg/dl)	0.38 ^a	0.32 ^a	0.32 ^a	0.31 ^a	0.01

^{abcd} means on the same row with different superscript are significantly different ($P < 0.05$). K: potassium, Ca: Calcium, P: Phosphorus, Mg: Magnesium, Na: Sodium

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CONCLUSION

The inclusion of *Cajanus cajan* leaf meal in the diets was favorable, acceptable, and tolerable to the rams. The result obtained showed that the *Cajanus cajan* leaf meal is a good source of protein, energy and minerals at a 15% 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 15% inclusion level in terms of serum macro minerals balance except magnesium.

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