# EVALUATION OF MACRO MINERALS IN THE BLOOD OF WEST AFRICAN DWARF GOATS FED VARYING LEVELS OF SORGHUM HULL AS REPLACEMENT FOR WHEAT OFFAL

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**ABSTRACT**

*This study was conducted to evaluated selected serum macro-mineral in West African Dwarf does fed varying levels of sorghum hull as replacement for wheat offal in 30-day feeding trial conducted at the Teaching and Research Farm of Oyo State College of Agriculture and Technology Igbo-ora, Nigeria. Twenty-four (24) growing WAD does of age 6-9 months with body weight of 6.00-10.00kg were randomly allocated to four treatments with six does each and 3 does per replicate in a completely randomized designed. The experimental diet was fed at 0, 33.33, 66.67 and 100.0% sorghum hull fed at varied proportions as replacement for wheat offal in complete diet for each individual animal per day. Two does per treatment were selected and blood was collected for analysis at the end of the feeding trial. Results revealed significant difference ($p<0.05$) for calcium, potassium, phosphorus, sodium and chlorine across the dietary treatments. Highest calcium value was observed in T3 (9.10 mg/dL) with T1 having the lowest value of 8.00 mg/dL. Does fed T4 diet had the highest potassium value (6.60 mg/dL) while T1 had the lowest value of 5.80 mg/dL. It was observed that doe fed diet T3 had the highest phosphorus value of 7.90 mg/while the lowest value (6.30mg/dL) was recorded in the doe fed diet T1. This study revealed that inclusion levels of sorghum hull at 66.67% as replacement for wheat offal diet has a good nutrient profile without any deleterious effects in serum macro-minerals concentration of growing does.*

**Keywords: Serum macro-minerals, Sorghum hull, Wheat offal, WAD does**

## INTRODUCTION

Ruminant animals contribute substantially to the world's human food supply, especially in the marginal areas of the tropics where population is on the increase (Alalade *et al.,* 2014). However, for these animals to play a leading role in food supplies, their nutrient requirement needs to be given adequate attention. In Nigeria, livestock commercial feeds are either not available or cost-prohibitive. Forages are readily available and cheap in the tropics, It is possible to reduce the cost of concentrates in the rations by utilizing forages that are nutritious and palatable to achieve a compromise between level of production and cost that is acceptable to producers (Eugene *et al.,* 2010). 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). This study was, therefore, designed to evaluate the selected serum macro minerals of WAD growing does fed varying levels sorghum hull as replacement for wheat offal.

## MATERIALS AND METHODS

### *Experimental site and animals*

The experiment was conducted at the Sheep and Goat Unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igbo-ora. Twenty-four (24) growing West African dwarf does weighing between 6.00 - 10.00kg and of 6–9 months of age were used. The animals were allowed to acclimatize for two weeks and treated against ectoparasites and endoparasites prior to the commencement of the experiment.

***Source of experimental diets***

Sorghum hull and wheat offal were purchased from feed mill at Igbo-ora market with other feed ingredients which include cassava peel, bone meal, sawdust, soya beans meal corn bran, palm kernel cake and salt were used to formulate diet for growing goats.

***Experimental layout, design and feeding method***

The does were allocated by weight into four treatments of six does per treatment and three animals as replicate in a completely randomized design (CRD). T1, T2, T3 and T4 diets, were contained 0%, 33.33%, 66.67% and 100.0% of sorghum hull respectively and the experiment lasted for four weeks. Each group of animals was assigned to an experimental diet and fresh and clean water was provided. Table 1 show the experimental diets formulation.

**Table1: Experimental diet formulation fed to growing West African Dwarf Goats (%)**

| Ingredients | $T_1$ (0.00%) | $T_2$ (33.33%) | $T_3$ (66.67%) | $T_4$ (100.00%) |
|---|---|---|---|---|
| Cassava peels | 32.00 | 32.00 | 32.00 | 32.00 |
| Palm kernel cake | 40.00 | 40.00 | 40.00 | 40.00 |
| Wheat Offal | 1.50 | 1.00 | 0.50 | 0.00 |
| Corn Bran | 10.00 | 10.00 | 10.00 | 10.00 |
| Saw Dust | 3.00 | 3.00 | 3.00 | 3.00 |
| Soyabean Meal | 12.00 | 12.00 | 12.00 | 12.00 |
| Sorghum Hull | 0.00 | 0.50 | 1.00 | 1.50 |
| Bone Meal | 1.00 | 1.00 | 1.00 | 1.00 |
| Common salt | 0.50 | 0.50 | 0.50 | 0.50 |
| **TOTAL** | **100.00** | **100.00** | **100.00** | **100.00** |
| % Crude Protein | 13.36 | 14.42 | 14.42 | 14.34 |
| ME (Kcal/kg) | 2626.95 | 2631.10 | 2631.10 | 2639.40 |

*, *ME= Calculated Metabolizable energy,*

**Blood collection for mineral analysis**

At the end of day 30 of feed trial, 5mL of blood sample was collected via the jugular vein of two does 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 subject to one-way analysis of variance using Statistical Analysis System (SAS, 2013), and differences among the means were separate using Duncan's multiple range test (Duncan, 1955).

**RESULTS AND DISCUSSION**

Selected serum macro-minerals of WAD does fed varying inclusion levels of sorghum hull as replacement for wheat offal was evaluated is presented in Table 2. There was significant ($p$<0.05) difference in the Ca concentration across dietary treatments with $T_3$ and $T_1$ having the highest and lowest value of 9.10mg/dLand 8.00mg/dL, respectively. Our observed value conforms with the values of 8 - 12mg/dL reported by Underwood and Suttle (1999) as the required Ca concentration in serum for a healthy sheep., and also corroborated to the value of 8.00 - 11.70mg/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/dLreported 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 6.30–7.90 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 range between 134.00–145.00mg/dLwere within the recommended range of 130.00 - 160.00mg/dLby Latimer *et al.* (2003), but were lower than the reported values of 326.60-345.00mg/dLin 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).

**Table 2: Selected serum macro minerals of West African Dwarf Growing Does fed varying inclusion level of sorghum hull as replacement for wheat offal**

| Parameters | $T_1$ | $T_2$ | $T_3$ | $T_4$ | SEM (±) |
|---|---|---|---|---|---|
| Ca (mg/dL) | $8.00^{d}$ | $8.90^{b}$ | $9.10^{a}$ | $8.40^{c}$ | 0.21 |
| K (mg/dL) | $5.80^{c}$ | $6,00^{b}$ | $6.00^{b}$ | $6.60^{a}$ | 0.15 |
| P(mg/dL) | $6.30^{c}$ | $7.20^{b}$ | $7.90^{a}$ | $7.20^{b}$ | 0.28 |
| Na (mg/dL) | $145.00^{a}$ | $137.00^{c}$ | $138.00^{b}$ | $134.00^{d}$ | 2,02 |
| Cl (mg/dL) | $110.00^{b}$ | $109.00^{b}$ | $134.00^{a}$ | $105.00^{c}$ | 2.17 |

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

## CONCLUSION

The inclusion of sorghum hull at varied levels as replacement for wheat offal in the diets was favorable, acceptable, and tolerable to the does. The result obtained showed that inclusion levels of sorghum hull at 66.67% as replacement for wheat offal diet is a good source of minerals.

### Recommendation

Based on the result of this research, it could be recommended that inclusion levels sorghum hull, particularly 66.67% as replacement for wheat offal diet is therefore recommended in the diet of WAD growing does in terms of serum macro minerals balance.

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