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MINERAL INTAKE AND BALANCE OF WEST AFRICAN DWARF GOATS FED GUINEA GRASS SUPPLEMENTED WITH *MYRIANTHUS ARBOREUS* LEAF MEAL CONCENTRATES

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ABSTRACT

Twelve (12) West African Dwarf bucks age 6-12 months with average live weight of 5.5kg were used to investigate the mineral intake and balance of guinea grass supplemented with Myrianthus arboreus leaf meal concentrates. Three bucks per treatment were assigned to four dietary treatments (diet A; 0.00% Myrianthus arboreus leaf meal, diet B; 10.00% Myrianthus arboreus leaf meal, diet C; 11.00% Myrianthus arboreus leaf meal, diet D; 12.00% of Myrianthus aboreus leaf meal). Results indicated that calcium intake was superior in goats fed diet C (1.16g/day) and the least value in goats fed diet B(0.83g/day). Phosphorous intake was significantly (P<0.05) influenced by the diets, with the highest value in goats fed diets B, C and D (0.09g/day) while the lowest value in goats fed diet A (0.07g/day). Potassium intake was highest (1.46g/day) in goats fed diets B and C. Sodium intake was superior (0.70g/day) in goats fed diet B.Highest calcium (0.55g/day), potassium (1.38g/day) and sodium (0.63g/day) retained were recorded in animals fed diet B, while Phosphorus retained ranged from 0.02-0.03g/day. Magnesium retention was superior (0.05g/day) in goats fed diet D. The mineral balance concentration observed in this study were adequate to support the optimum performance of the goats.

Keywords: mineral intake, mineral balance, ruminant, *Myrianthus arboreus*

INTRODUCTION

The main aim of ruminant production is for meat and milk. However, this venture is faced with insufficient feed (forage) supply especially during the dry periods of the year, thereby leading to low carcass and milk yield, and often times death of animals with a consequential economic loss to farmers (Ibhaze *et al.*, 2020). Research among ruminant nutritionist is recently geared towards harnessing the potentials in non-conventional feed forages in ameliorating these adverse effects on the animals. *Myrianthus arboreus* leaves are a good source of protein (18.74% DW) with a threshold for tannins of 2-5% for cattle and 9% for goats (Edoga and Enata 2011) and can be considered as a supplement in compounding of livestock feed. The mineral content in the leaves are quite high and it contain appreciable levels of sulphur containing amino-acid, which makes it a good source for livestock feed supplementation in regions where chronic deficiency of sulphur-containing amino acids occur (Agbor *et al.*, 2004). The objective of this study is to evaluate the mineral intake and balance of guinea grass supplemented with *Myrianthus arboreus* leaf meal concentrates by West African Dwarf goats.

Materials and methods

Experimental Site

The experiment was conducted at the Small Ruminant Unit of the Teaching and Research Farm, Federal University of Technology, Akure, Ondo state, Nigeria. Akure is located on longitude 4.944055^{o}E and 5.82864^{o}E, and latitude 7.491780^{o}N with annual rainfall ranging between 1300mm and 1650mm average maximum and minimum daily temperature of 38^{o}c and 27^{o}c respectively (Daniel, 2015).

Sourcing and processing of feed materials

Fresh leaves of *Myrianthus arboreus* was collected from trees in Ilara - Mokin along Ilesa Road and other ingredients were sourced from reputable feed mills in Akure, Ondo State, Nigeria. The leaves were air dried under shade for a week and milled using the hammer mill and all materials were manually mixed.

Experimental animals and their management

Twelve (12) West African Dwarf bucks age 6-12 months with average live weight of 5.5kg were used. Four dietary treatments were formulated and three bucks were assigned to a treatment such that each served as a replicate. The bucks were fed the experimental diets early in the morning (8.00am) and grass was given in the afternoon (2.00pm) and cool, fresh drinkable water was supplied.

Experimental design and statistical analysis

The completely randomized design was adopted Data generated were subjected to analysis of variance using SAS, (2012) version 9.2 and where significant differences were found, the means separation was done using the same package

RESULT AND DISCUSSION

Mineral intake and balance of WAD goats fed experimental diets

The mineral intake by WAD goats fed experimental diets is presented in Table 2. Highest calcium intake was observed in goats fed diet C (1.16g/day) and the lowest value in goats fed diet B(0.83g/day). Phosphorous intake was significantly affected ($P<0.05$) by the diets, the lowest was observed in goats fed diets C and D (0.07g/day) while the highest was observed in goats fed diets A and B (0.09g/day).Potassium intake in goats fed diet A (1.00g/day) was least while the highest value (1.46g/day) was observed in goats fed diets B and C. Low intake of potassium may lead to inadequate energy metabolism since an imbalance in the intake of Na and K can result in inhibition of ATP (which depends on Na+K+ and metabolism of energy in animals). Sodium intake was superior (0.70g/day) in goats fed diet B. Generally, calcium, phosphorous, and magnesium composition of the diets were adequate to meet the requirement of goats and the value compared favourably with the recommended values of 0.2–0.8% (Ca), 0.16 – 0.32%(P) and 0.12 – 0.18% (Mg) respectively (Mc Dowell,1992) and also the recommendation of NRC (1985). The Potassium (K) concentrations observed in this study were much higher than the range of (0.13 to 0.22%) reported by Ranjhan (1993) however, values observed in this study compared favourably to the values suggested by McDowell (1992) for growing ruminants.

The calcium values were above the value 0.20 – 0.82% reported by McDowell (1992). This is an indication of calcium availability in the diet. However, the observed phosphorous balance values were below the recommended value for healthy goats by McDowell (1992). This could be as a result of many mineral interactions in the feed ration influencing net absorption (Haenlein, 1987).Phosphorus is stored in form of phytic acid and ruminants are readily able to digest phytate because of the phytase produced by rumen micro-organisms. Unabsorbed phytate passes through the gastrointestinal tract, elevating the amount of phosphorus in the manure. Excess phosphorus excretion can lead to environmental problems, such as eutrophication (Mallin, 2003). The low values observed might be due to substantial loss through faeces and urine which are the major route of magnesium excretion from the body when absorbed in excess of requirement and sodium excess is loss through urine and sweat.

CONCLUSION

Feeding *Myrianthus arboreus* concentrate meal as supplement to guinea grass could enhance goat production, provide the required mineral balance for WAD goats for good performance.

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Table 1: Gross compositions of experimental diets

	Diets			
Ingredients	**A**	**B**	**C**	**D**
Maize Offal	47.00	47.00	47.00	47.00
Rice bran	27.00	27.00	27.00	27.00
Palm kernel cake	22.00	12.00	11.00	10.00
M. Arborues	0.00	10.00	11.00	12.00
Urea	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00
Salt	1.00	1.00	1.00	1.00

Table 2: Mineral Intake (g/day) of WAD goats fed experimental diets

	Diets				
Parameters (g/day)	A (0%)	B (10%)	C (11%)	D (12%)	±SEM
Calcium	1.03[a]	0.83[b]	1.16[a]	1.11[a]	0.07
Phosphorus	0.07[b]	0.09[a]	0.09[a]	0.09[a]	0.01
Magnesium	0.12	0.12	0.13	0.13	0.01
Potassium	1.00[b]	1.46[a]	1.46[a]	1.09[b]	0.06
Sodium	0.39[b]	0.70[a]	0.45[b]	0.48[b]	0.04

Table 3: Mineral balance (g/day) of WAD goats fed experimental diets

	Diets

Parameters	A (0%)	B B (10%)	C C (11%)	D (12%)	SEM
Calcium Intake	0.83[b]	1.03[a]	1.16[a]	1.11[a]	0.07
Faecal Calcium	0.32[b]	0.27[b]	0.40[b]	0.46[a]	0.34
Urinary Calcium	0.20	0.21	0.23	0.24	0.01
Calcium Retained	0.31	0.55[a]	0.53[a]	0.41[c]	0.05
Phosphorus Intake	0.08[a]	0.09[a]	0.09[b]	0.08[b]	0.01
Faecal Phosphorus	0.03	0.04	0.03	0.03	0.01
Urinary Phosphorus	0.03	0.02	0.03	0.02	0.01
Phosphorus Retained	0.02	0.03	0.03	0.03	0.01
Magnesium Intake	0.13	0.13	0.12	0.12	0.01
Faecal Magnesium	0.05	0.05	0.04	0.04	0.01
Urinary Magnesium	0.04	0.04	0.06	0.03	0.04
Magnesium Retained	0.04	0.04	0.02	0.05	0.04
Potassium Intake	1.00a	1.46a	1.14a	1.09b	0.01
Faecal potassium	0.04	0.05	0.06	0.05	0.01
Urinary Potassium	0.03	0.03	0.03	0.04	0.01
Potassium Retained	0.93[b]	1.38[a]	1.05[b]	1.00[b]	0.01
Sodium Intake	0.39[b]	0.70a	0.45b	0.48b	0.04
Faecal Sodium	0.04[b]	0.04[ab]	0.03[b]	0.05[a]	0.04
Urinary Sodium	0.03	0.03	0.03	0.03	0.06
Sodium Retained	0.32[b]	0.63[a]	0.39[b]	0.40[b]	0.01

a,b,= means within the same row with different superscripts are significantly (P<0.05) different.