SERUM CALCIUM AND PHOSPHORUS LEVELS IN BROWN SAVANNA BUCKS AND DOES KEPT SEMI-INTENSIVELY

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Abstract
A ten (10) weeks experiment was conducted to establish a baseline data on the levels of Calcium and Phosphorus in the blood serum of ten (10) Savanna Brown goats (9-12months old with an average body weight of 13.55kg) consisting of five (5) males and five (5) non-lactating and non-pregnant females reared under semi intensive system of management and 9000g of yam peel per day was provided as supplemental feed. The study was carried out at the Teaching and Research Farm of the Department of Animal Production Technology, Federal University of Technology Minna, Gidan Kwanu Campus, Minna, Niger State. The goats were allotted into two (2) treatments with each treatment consisting of five (5) replicates of male and female goats respectively using a completely randomized design (CRD). Blood samples were taken from both male and female goats bi-weekly for a period of ten (10) weeks via jugular vein puncture using a 5ml syringe. Blood samples (5ml each) were collected into anti-coagulant free plastic tubes, allowed to coagulate at room temperature and centrifuged for 15minutes at 3000rpm. The supernatant sera were then stored (at -20°C) prior to analysis. Data were statistically analyzed using one way analysis of variance (ANOVA) and significant differences between means were separated using Duncan's Multiple Range Test (DMRT). The results show that there were no significant differences (P>0.05) between the Serum Calcium levels for bucks (2.64±0.33mmol/L) and does (3.03±0.54mmol/L) and Phosphorus levels for bucks (1.34±0.12mmol/L) and does (1.40±0.16mmol/L) within the weeks of study. It was concluded that the serum calcium and phosphorus obtained from the experimental animals meet the normal values in the body of growing goats; although the serum phosphorus levels were low. It is recommended that goats kept semi-intensively in the study area should be provided with free choice mineral supplements, especially Phosphorus for their optimum productivity because the phosphorus levels observed in this study was low although it falls within the normal range.

Keywords: calcium, phosphorus, goats and semi-intensive system

Introduction

Population of goats in Nigeria is evaluated to be about 52.4million and this make goat to be the second most populated domesticated animals after chickens (FMAWR, 2008). Goats are significant ruminant animal in subsistence farming because of their unique ability to acclimatize to a harsh environment (Odeyinka and Okunade, 2004). They are well adapted to harsh climate, hence, they find themselves able to make do on plants that would regularly not be eaten by other domesticated animal species because of their grazing habits and physiological characteristics (Gutierrez, 2003). Small ruminants are relatively easier to manage and produce than other species *of* livestock. The bulk of goat production in Nigeria is mostly managed under semi-intensive system of management (Alawa, 2002).

There is a great variation in the biochemical parameters between breed of goats (Tambuwal *et al.*, 2002) and as in such, it may be hard to plan a general metabolic profile test of goats. Minerals are inorganic nutrients which are subdivided into macro minerals required in concentrations greater than 100 ppm (parts per million) and often as a percentage of the diet (or g per kg) per day and micro minerals required in smaller quantities of less than 100 ppm and are expressed as ppm and sometimes as ppb (parts per billion) (McDowell, 2003).

Minerals play a fundamental role in forage digestion, reproductive performance, and the development of bones, muscles, and teeth (Smith and Sherman, 1994). For instance, Calcium or Phosphorus levels below or above normal indicate problems with health status of goats (Invartsen and Andersen, 2000).

According to Agarwal *et al.* (2006), blood is a specialized body fluid that performs several vital functions, hence, it has been frequently referred to as the seat of the soul. As such, blood could be used in assessing the nutritional status of animals. Most of the time it has five fundamental components and they are Serum, Plasma, Clotting factors, Lipids and Proteins, and Blood cells. It has likewise been accounted for that blood serum is basically the most fundamental neutral piece of blood and it is regularly depicted as plasma with all its clotting components removed. On its own, serum comprise of water and certain fatty proteins however blood

would not have the right consistency or science without it. Its neutrality makes it important for distinctive medical tests and scientists have idealized methods for secluding the substance keeping in mind the end goal to analyze a scope of diverse conditions and problems.

Studies ought not to be constrained to performance, carcass quality and nitrogen alone, yet its impact on blood constituent is likewise extremely significant (Animashaun *et al.* 2006). Therefore, this study was aimed at establishing the physiological baseline values of the Serum Calcium and Phosphorus levels in both male and female Savanna Brown goats kept under semi-intensive system of management within the University Research Farm.

Materials and Methods

Experimental animals and their management

A ten (10) weeks experiment was conducted on ten (10) Savanna Brown goats (6-10months) consisting of five (5) males and five (5) non-lactating and non-pregnant females. The goats were managed under semi-intensive system of management in which they were allowed to graze on natural pasture during the day (9a.m till 5p.m) but confined in the evening in a well-ventilated pen and 9000g of yam peel per day was provided as supplementary feed. The pen was routinely cleaned and disinfected while the animals were given prophylactic treatment, the animals were dewormed using Albendazole at the dosage rate of 5ml/10kg body weight, they were given Terramycin Long Acting through intramuscular route at the dosage rate of 1ml/10kg body weight and were also treated against ectoparasites using Ivomec at the dosage rate of 0.5ml/10kg body weight. The goats were further allotted into two (2) treatments with each treatment consisting of five (5) replicates of male and female goats respectively using a completely randomized design (CRD).

Blood collection

Blood samples were collected in the early morning hours before the animals were taken for grazing. 5mls blood sample was collected through the jugular vein puncture with a 5mls needle and syringe and at that point drawn by vacuum into cleaned tubes. 10 samples were obtained during each collection period (bi-weekly). The sample bottles were kept on ice in a cool box and were immediately transported to the laboratory for analysis at State Veterinary Center located at Bosso, Minna, Niger State, Nigeria. Blood samples were centrifuged at 3000rpm for 15minutes to obtain serum which were stored at -20°C prior to analysis. Samples were prepared according to the procedure of Fick *et al.* (1979). Serum Calcium concentration was determined by Atomic Absorption and Serum Phosphorus concentration was determined by Colorimetry using a Spectrophotometer with visible UV.

Data analysis

The data collected were subjected to one way analysis of variance (ANOVA) as contained in the SAS (SAS, 2003) and the means were separated using Duncan's Multiple Range Test (DMRT). Significance was set at ($P<0.05$).

Results and Discussion

Table 4.1 shows the mean serum calcium and Phosphorus levels obtained in this study. The serum Calcium was between 2.44mmol/l to 2.76mmol/l for bucks and between 2.78mmol/l to 3.26mmol/l for does while the serum Phosphorus levels obtained in this study was between 1.24mmol/l to 1.50mmol/l for bucks and between 1.22mmol/l to 1.58mmol/l for does. In the present study, the serum calcium and phosphorus levels obtained were within the normal levels required in the body of growing goats which agrees with the findings of Deepak *et al.*(2007) where they obtained (Ca (2.3-3.0mmol/L) and P(1.0-3.6mmol/L)) which is also consistent with the values obtained in previous studies (Daramola *et al.*, 2003), their findings revealed serum calcium and phosphorus levels to be 1.5±0.4mmol/L and 2.7±1.4mmol/L which is within normal range.There was no significant ($P>0.05$) difference in serum calcium levels between bucks and does for all the weeks. However, the average mean value of serum calcium in does (3.03±0.54mmol/L) was higher than the average mean value in bucks (2.64±0.33 mmol/L).

The serum Phosphorus level for bucks had its highest value at week 10(1.50mmol/L) and the lowest value at week 8(1.24mmol/L) and the serum Phosphorus level for does had its highest value at week 6(1.58mmol/L) and the lowest value at week 10(1.22mmol/L). There was no significant ($P>0.05$) difference in serum phosphorus levels between bucks and does for all the weeks. However, the average mean value of serum phosphorus in does (1.40±0.16) was higher than those obtained in bucks (1.34±0.12). The non-significantly low phosphorus levels obtained in this current study is related to the report of Minson (1990) in which the researcher pointed out that phosphorus deficiencies were attributed to be more prevalent in tropical grazing regions and that this has tremendous implications on goat performance. Kalio *et al.* (2014) in their study to determined the haematology and biochemistry of West African dwarf (WAD) goats fed crop by-products in humid

tropical Nigeria, they reported that the mean serum levels of calcium ranged between 2.25 – 2.76 mmol/L in the animal fed yam peel. The Ca level obtained in the current study (2.44mmol/L to 3.26mmol/L) was higher than those obtained in their study.

Furthermore, Kalio *et al.* (2014) reported mean serum level of phosphorus ranging between 3.75 - 4.77 mmol/L in the animals fed yam peels which revealed that the current mean serum phosphorus value (1.22mmol/L to 1.50mmol/L) obtained in this study is lower than those obtained in their study. However, breed differences, different management practices and geographical factors might have been responsible for the variation noticed.

The higher average serum calcium and phosphorus levels obtained in does as compared to bucks might be as a result of fluctuations in their physiological status most especially estrus activity (Esminger, 2002).

Conclusion

The current study reveals that there was no significant ($P>0.05$) difference in the serum calcium and phosphorus levels of the animals under study. However, the average serum calcium and phosphorus levels in does were higher than those of the bucks. The serum levels of Calcium and Phosphorus obtained from experimental goats were adequate to meet the normal levels required in the body of goats for proper growth and development. Therefore it is recommended that goats kept semi-intensively in the study area should be provided with free choice mineral supplements, especially Phosphorus for their optimum productivity because the phosphorus levels observed in this study was low although it falls within the normal range.

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Table 4.1: Serum Calcium and Phosphorus levels observed in Brown Savanna Bucks and Does kept

Minerals (mmol/l)	Group	Week 2	Week 4	Week 6	Week 8	Week 10	A V	S V (mmol/l)
Ca	Male	2.76±0.43[a]	2.76±0.35[a]	2.44±0.41[a]	2.62±0.25[a]	2.62±0.23[a]	2.64±0.33	2.3 - 3.0
	Female	3.26±0.18[a]	3.12±0.27[a]	2.78±0.62[a]	3.20±0.13[a]	2.78±0.15[a]	3.03±0.54	2.3 - 3.0
P	Male	1.28±0.19[a]	1.36±0.21[a]	1.32±0.28[a]	1.24±0.11[a]	1.50±0.20[a]	1.34±0.12	1 - 3.6
	Female	1.42±0.12[a]	1.40±0.05[a]	1.58±0.37[a]	1.36±0.16[a]	1.22±0.10[a]	1.40±0.16	1 - 3.6

semi-intensively in Departmental Livestock Research Farm, F.U. T, Gidan Kwanu Campus, Minna.
Mean ± Standard Error of Mean. SV: Standard Value of Calcium and Phosphorus (Deepak *et al.*, 2007). AV: Average Mean Value of Calcium and Phosphorus across the week.