

## Variation in the Mineral Components of Ewes and Does' Colostrum

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A total of 12 lactating animals of equal number (6 Ewes) and (6 Does) were used for this study. This present study advanced on the difference between the mineral components of Ewes and Does' colostrum. The animals used for this present study were selected from Chaha and Livestock Investigation Department (LID) of National Veterinary Research Institute (NVRI) Vom, Plateau State, Nigeria. 6 mls samples of colostrum was obtained from each lactating dam (Ewes and Does) from the teat of their udder by gentle stripping to avoid injury into fresh clean sample collection bottles (Vacutainer tubes) following the standard procedure. The ash contents of the colostrum samples of Ewes and Does were determined following the standard procedure of Association of official analytical chemistry (AOAC). The mineral composition such as calcium (Ca) was measured in the ash using atomic absorption, Unicam 929. Phosphorous (P) was determined

colorimetrically in the ash following the procedure of AOAC. The results of this present findings of the calcium, phosphorus and ash contents in the colostrum of Ewes were significantly ( $P < 0.05$ ) higher than those of the Does investigated. Based on the species speciation, the lambs have higher consumption of minerals in the Ewes' colostrum than the kids. However, based on the results of this findings, it would be recommended that the variations in the mineral levels of colostrum of the species investigated would provide the bases for identification of species that are rich in mineral constituents in their colostrum for consumption by the young (lambs and kids).

**Keywords:** Difference, minerals, components, colostrum, mammalia.

### INTRODUCTION

Milk is a fluid produced by the female of all mammalian species, the primary function of which is to meet the complete nutritional requirements of the young while serving several physiological functions (Nakamura *et al.*, 2003). Colostrum is the secretion produced by the mammary gland immediately after parturition. The composition and physical features of colostrum varied due to a some factors, which include individuality, breed, parity, pre-partum nutrition, length of the dry period of cows and time post-partum (Georgiev, 2008). Colostrum contains less lactose and more fat, protein, peptides, non-protein nitrogen, ash, vitamins and minerals, hormones, growth factors, cytokines and nucleotides than mature milk; except in the case of lactose, the levels of these compounds decline rapidly within the first 3 days of lactation (Uruakpa *et al.*, 2002). Colostrum is known by its very high concentration of immunoglobulin G (IgG), which is of specific importance to the young whose gastrointestinal tract, prior to parturition, enables the

passage of large immunoglobulins, thereby conferring passive immunity (Stelwagen *et al.*, 2009). It is essential that the newborn lambs and kids receives an adequate supply of colostrum as both the concentration of immunoglobulins and permeability of the gastrointestinal tract (GIT) decline rapidly over the first 24 h prior to parturition (Moore *et al.*, 2005). In addition, colostrum intake influences metabolism, endocrine systems and the nutritional state of neonatal offspring and encourage the development and functionality of the GIT. Most healthy dairy mammals produce colostrum far in excess of the neonate requirements but, typically, milk collected during the colostrum period is considered unmarketable and often is excluded from bulk milk collection (Marnila and Korhonen, 2002). The high protein content of colostrum results to multiple problems in industrial processes, e.g. poor heat stability, which coincides with pasteurization (Marnila and Korhonen, 2002). Also, the high content of antimicrobial components in colostrums may alter the

fermentation process (Marnila and Korohnen, 2002). Changes in the contents and physical properties of milk throughout lactation have been investigated extensively (Rodriguez *et al.*, 2001). There are distinct differences in physico-chemical characteristics between goat and sheep milk. Therefore, changes in goat and sheep milk compositions occur by seasons, because towards the end of the lactation, the fat, protein, solids and mineral contents increase, while the lactose content decreases (Haenlein, 2004). Therefore the present study sought the difference in the mineral components of Ewes and Does' colostrum.

## MATERIALS AND METHODS

### Experimental location

The present study was carried out in the National Veterinary Research Institute Vom, Plateau State, Nigeria. Plateau State is situated in Nigeria's middle belt. With an area of 26,899 km<sup>2</sup>. The State has an estimated population of about three million people. It is located between Latitude 08° 24'N and Longitude 08° 32' and 10° 38' E. The altitude ranges from around 1,200m to a peak of 1,829 m above the mean sea level. The state is positioned in the tropical zone of Nigeria with an average temperature of between 13 and 22°C. Harmattan winds causes the coldest weather between December and February. The warmest temperatures usually occur in the dry season months of March and April. The mean annual rainfall varies between 131.75 cm in the Southern part to 146 cm on the Plateau (NIMET, 2017). The highest rainfall is recorded during the wet season months of July and August.

### Experimental animals

A total of 12 lactating animals of equal number (6 Ewes) and (6 Does) were used for this study. The animals were selected from Chaha and Livestock Investigation Department (LID) of National Veterinary Research Institute (NVRI) Vom, Plateau State, Nigeria.

### Sample collection

6 mls samples of colostrum was obtained from each lactating dam (Ewes and Does) from the teat of their udder by gentle stripping to avoid injury into fresh clean sample collection bottles (Vacutainer tubes) following the standard procedure.

### Chemical analysis

Chemical composition of the ash of the colostrum samples of Ewes and Does were determined following

the standard procedure of AOAC, (1990). Mineral contents such as calcium (Ca) were measured in the ash using atomic absorption, Unicam 929 (AOAC, 1990) and Phosphorous (P) was estimated colorimetrically in the ash according to the procedures of (AOAC, 1990).

### Statistical analysis

All statistical analyses were done using standard spreadsheet software of excel and the General Linear Model (GLM) of the Statistical Package for Social Sciences (SPSS version 22). The level of statistical significance was defined as (P<0.05). Fisher's Least Significance difference (LSD) was used to separate the means.

## RESULTS AND DISCUSSION

The results of (Table 1) showed the means and standard deviation for calcium, phosphorus and ash contents of colostrum of Ewes and Does respectively. The results of (Table 2) showed the test of homogeneity among the minerals studies. This indicates that the test was not significant. Once the test of homogeneity indicates not significance (p<0.05), it is an indication that the data collected were consistent and reliable. The results of mineral levels in ewes and does' colostrum were statistically significant (P<0.05) as presented in (Table 3). The result of the calcium level, phosphorus level and ash content in the colostrum of Ewes were significantly higher (P<0.05) than those of does studied. The means of the calcium levels in the colostrum of the ewes were higher than those of the doe as indicated in the chart (Figure 1). The means of the phosphorus levels in the colostrum of the ewes were higher than those of the doe as indicated in the chart (Figure 2). The means of the ash levels in the colostrum of the ewes were higher than those of the doe as indicated in the chart (Figure 3). The results of the calcium, phosphorus level and ash contents in the colostrum of Ewes were significantly higher (P<0.05) than those of the Does studied. Maraval and Vignon, (1982) observed significant changes in the concentration of mineral elements in goat milk in the first 7 weeks of lactation. Furthermore, Khan *et al.* (2006) found significant influence of season and breed on the concentration of most mineral elements in sheep milk. The content of major elements in milk differs significantly from the content in blood. Compared to blood, milk contains more potassium, calcium and phosphorus, and less sodium and chloride. This is due to the sodium-potassium pump that regulates osmotic pressure between the cytoplasm of blood cells and milk. At the same time, calcium is transported from the basal membrane to cytosol and onward into the Golgi apparatus of the alveolar cells of the mammary glands to

**Table 1.** Descriptive statistics for mineral levels of Ewes and Does' colostrums

Composition	Species	Mean	Standard deviation
Calcium	Ewes	0.277	0.049
	Does	0.195	0.024
Phosphorus	Eves	0.002	0.000
	Does	0.001	0.000
Ash	Ewes	1.327	0.090
	Does	0.672	0.197

**Table 2.** Test of homogeneity among the mineral levels in the colostrums of the species studied.

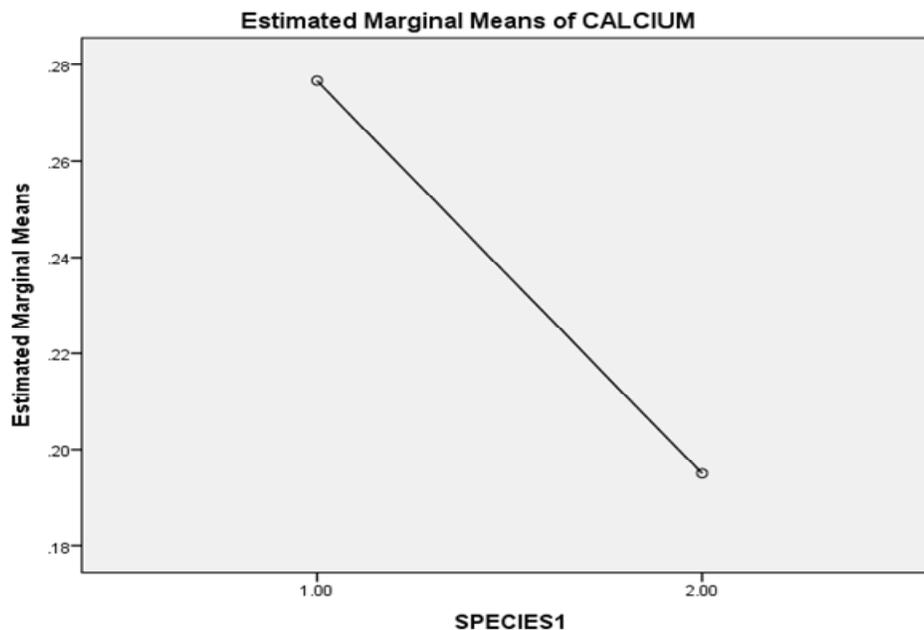
Composition	F	df1	df2	Sig.
Calcium	2.101	1	10	0.178
Phosphorus	2.500	1	10	0.145
Ash	2.613	1	10	0.137

**Table 3.** Mineral levels in Ewes and Does' colostrums.

Composition		Ewe	Doe	LOS
		Mean $\pm$ SE	Mean $\pm$ SE	
Calcium	(g/100g)	0.277 $\pm$ 0.016 <sup>a</sup>	0.195 $\pm$ 0.016 <sup>b</sup>	**
Phosphorus	(g/100g)	0.002 $\pm$ 0.000 <sup>a</sup>	0.001 $\pm$ 0.000 <sup>b</sup>	**
Ash	(g/100g)	1.327 $\pm$ 0.037 <sup>a</sup>	0.672 $\pm$ 0.000 <sup>b</sup>	**

abc- means on the same row bearing different superscripts are significantly different (P<0.05).

\*\*Significant at (P<0.05). SE- Standard error. LOS= level of significance.



1.00= Ewes

2.00=Does

**Figure 1.** Estimated marginal means of calcium in the colostrums of Ewes and Does.

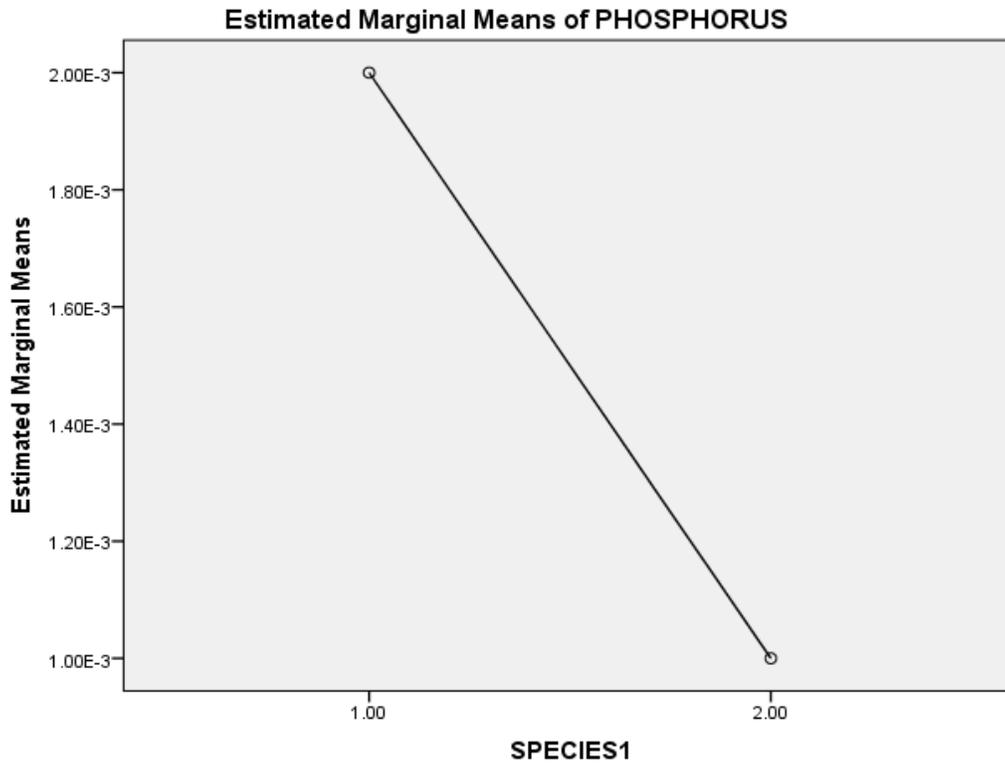


Figure 2. Estimated marginal means of phosphorus in the colostrums of Ewes and Does.

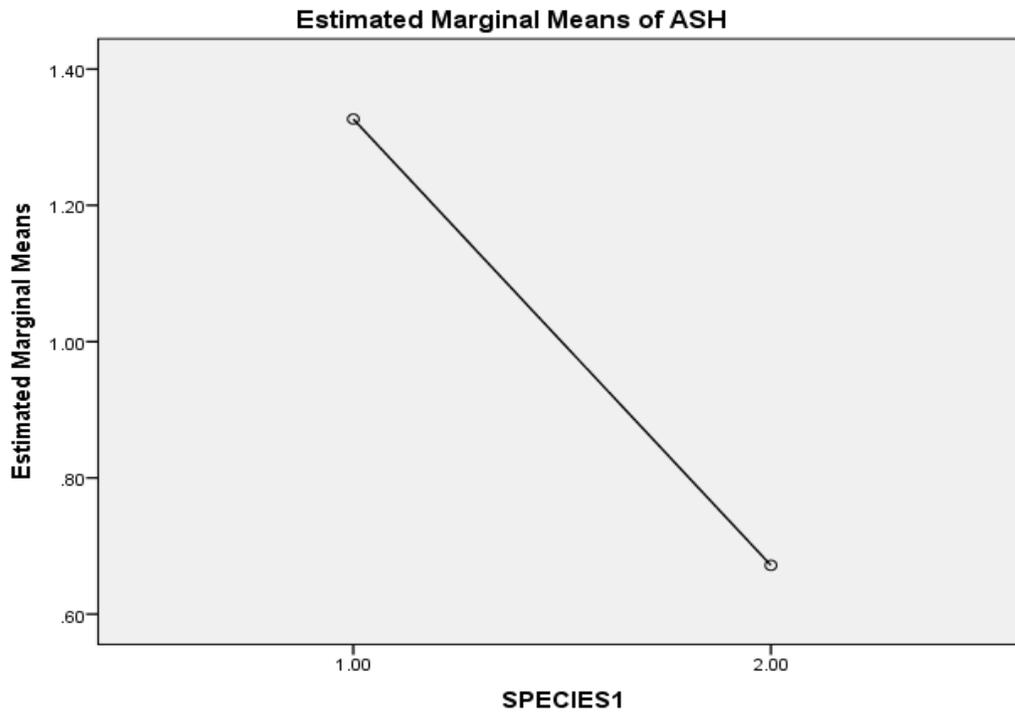


Figure 3. Estimated marginal means of ash in the colostrums of Ewes and Does.

be incorporated into casein micelles (Paulina and Bencini, 2004). The present findings of the ash level in the colostrum of the three species investigated corroborates with the report of O'Connor (1994) who worked on some mineral elements present in the small ruminants species. Calcium is responsible for many regulatory functions, such as normal cardiac rhythm maintenance, blood clotting, hormone secretion, muscle contraction and enzyme activation (Cashman, 2002a). The result of this study shows increased calcium level in ewes' milk is in agreement with the work of Dupas *et al.* (2009) and Faith *et al.* (2017) who opined that, increase in the calcium level of milk and serum could slightly due to their contents in highly phosphorylated fragments of caseins, and these peptides appear mainly during the processing of milk products such as cheese or yoghurt. Also Faith *et al.* (2017) in their findings reported that Calcium concentration of both pregnant and lactating ewes were normal and intact as reported by other literatures. Phosphorus level of the ewes' colostrum was higher ( $P < 0.05$ ) than those of does' colostrum. The present result of the increased phosphorus level of ewes' colostrum agrees with the report of Haenlein, (2004) who reported an increased phosphorus level of colostrum in ewes. Phosphorus occurs as organic or inorganic phosphate in all body tissues and fluids and is the main component of many biological compounds, including lipids, proteins, carbohydrates and nucleic acids (Cashman, 2002a).

## Conclusion

The results of the calcium level, phosphorus level and ash contents in the colostrum of Ewes were significantly higher ( $P < 0.05$ ) than those of the Does studied. Based on the species speciation, the lambs have higher consumption of minerals in the Ewes' colostrum than the kids.

## Recommendation

However, based on the results of this findings, it would be recommended that the variations in the mineral levels of colostrum of the species investigated would provide the bases for identification of species that are rich in mineral constituents in their colostrum for consumption by the young (lambs and kids).

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