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Influence of Dietary *Enterolobium Cyclocarpum* leaves on Colostrum Composition of West African Dwarf does

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ABSTRACT
Diets type influence the composition of colostrum and the degree of passive immunity conferred on the young. The purpose of the research was to assess the composition of colostrum of West African dwarf (WAD) goats fed varying proportions of *Enterolobium cyclocarpum* (EC) leaves. Sixteen pregnant does were randomly assigned into four treatment groups, with four replicate per treatment and fed the experimental diets for about six weeks (4th month of pregnancy till the 7th day post-partum). Does on Treatment 1 were fed concentrate diets without EC leaves (EC0). Treatment 2 contained 7.50 % EC leaves (EC7.5), Treatment 3 consisted of 15. 00 % EC leaves (EC15) while Treatment 4 contained 22.50 % EC leaves (EC22.5). Colostrum samples were collected on the 1st day (6-24 hours) post-partum, taken to the laboratory and analyzed for lactose, proximate, energy other carbohydrates and mineral constituents. There were significant differences ($p<0.05$) in total solids (14.53 – 20.22%), lactose (4.11 – 5.64%), protein (5.25 – 8.05%), butter fat (1.44 – 3.94%), solids-not-fat (11.84 – 18.78%), ash (0.73 – 0.92%), carbohydrates (4.37 – 10.32%) and energy (3.09 – 4.17 MJ/kg) compositions. Colostral butter fat was significantly highest ($p<0.05$; 3.94 %) in the EC15 sample. Concentration of total solids, lactose, proteins, solids-not-fat and energy were significantly highest ($p<0.05$) in the colostrum of does fed EC22.5 (Treatment 4). Concentrations of calcium (30.07 – 44.36 mg/100g) and magnesium (19.21 – 23.59 mg/100g) were highest in EC15.0 fed colustrum. Phosphorus was 6.01 – 9.41 mg/100g and was significantly highest ($p<0.05$) in the colostrum of does fed EC22.5. Thus WAD does should be fed a concentrate diet containing 22.50 % *Enterolobium cyclocarpum* leaves for improved constituents of proteins and other nutrients in the colostrum that will confer the highest degree of passive immunity to the kids.

Keywords: colostrum, *Enterolobium cyclocarpum*, colostrum constituents, minerals, WAD does, immunity.

1.0 INTRODUCTION

In-utero, the fetus depends on the dam for regular supply of nutrients via the placenta. After parturition, there is an abrupt change where the neonate is exposed to an environment filled with both beneficial and pathogenic microorganisms. Neonate nutrients supply for development, immunity and other physiological functions is now irregular via milk intake through the digestive tracts. Colostrum, the first form of milk produced by mammals one to four days after parturition is nutrient-dense and contains antibodies (globulins) to fill these roles (Clark and García, 2017). Livestock such as cows and goats can secrete colostrum some days before parturition. Other animal species such as pigs, sheep and horses and even human beings, start secreting colostrum few hours before parturition (Egbowon *et al.*, 2007).

Colostrum provides nutrition and antibodies for passive immunity to the neonates, allowing for the development of the digestive and immune systems (S´anchez-Macías *et al.*, 2014; Clark and García, 2017). Colostrum is rich in nutrients and bioactive substances such as total protein, caseins, fat, minerals, dry matter, albumin, granulocyte-macrophage-stimulating growth factor, LTF, IgA, IgG, IgM, lymphocytes, (Liu *et al.*, 2021; Clark and García, 2017; Wikipedia, 2023), growth factors, antimicrobial proteins, anti-inflammatory, immune-enhancing, antioxidant components and other growth factors (Niyazbekova *et al.*, 2020). Components of colostrum that confers innate immunity include lactoferrin, complement, cytokines, lysozyme, proline-rich polypeptides and lactoperoxidase.

Enterolobium cyclocarpum is a flowering tree that belongs to the pea family known as Fabaceae. The leaves of *Enterolobium cyclocarpum* are rich in chemical constituents such as crude protein 22.05 %, crude fibre 3.10 %, ether extract 3.23 %, ash 4.40 %, nitrogen free extract 66.57 %, 57.86 % neutral detergent fibre, 39.37 % acid detergent fibre, 14.83 % acid detergent lignin, 18.49 % hemicellulose, 24.54 % cellulose, 0.24 % calcium, 0.33 % phosphorus, 0.63 % potassium, 0.28 % magnesium and 0.17 % sodium (Ekanem *et al.*, 2020a). In a preference study that WAD bucks were offered fresh and differently preserved EC leaves, the bucks choose the fresh EC leaves to the ensiled and sundried leaves due to its high protein contents (Ekanem *et al.*, 2020b). In another experiment in our station, WAD bucks fed 15.00 % EC leaves instead of 0.00 %, 7.50 % and 22.50 % EC leaves performed better in terms of growth, carcass and sensory characteristics (Ekanem *et al.*, 2022). On the other hand, lactating WAD does fed 7.50 % EC leaves (and not 0.00 %, 15.00 % and 22.50 % EC leaves) diet produced maximum milk yield that enhanced kids' growth (Ekanem *et al.*, 2024).

Factors influencing colostrum yield and chemical composition include nutrition (Egbowon *et al.*, 2005; Anya and Ozong, 2018), breed, dam age, gestation length, live weight changes during gestation, body condition score, birth weight of the neonates (Campion *et al.*, 2019), parity and litter size (single, twins and triplets) (Kessler *et al.*, 2019). As at the time of this write-up there is dearth of information on the lactation performance of livestock fed EC leaves. The objective of this research therefore was to examine the feeding value of *Enterolobium cyclocarpum* leaves on the colostrum composition of lactating WAD does.

2.0 MATERIALS AND METHODS

This research was conducted at the University of Uyo, Uyo, Akwa Ibom State, Nigeria Teaching and Research Farms. Uyo is located between latitudes 4˚30´ and 5˚30´ N and longitudes 7˚25´ and 8˚15´ E. The android phone application "GPS Test" recorded the following GPS values for

the farm site: N $5^0$03′44.292″; E $7^0$52′38.478. Rainfall in Uyo ranges from 800 – 3,200 mm per annum and have a bimodal pattern - March to August with two weeks of break in August and August till October with peaks in June and September. Dry season was from November till February. Annual temperature ranged between 23 ^{0}C – 28 ^{0}C while average relative humidity was 80% (74 – 85%) (The Meteorological station, University of Uyo, 2019).

2.1 Animal management

Sixteen (16) pregnant does in their fourth month (91st day) of gestation were selected from the herd and used for the research. Prior to the commencement of the research, the does were separated from the bucks for three weeks before mating. Thereafter, a stud buck was reintroduced to serve the does which came on heat simultaneously. Recommended medications (Long Acting Oxytetracycline and Ivermectin injections; albion multivitamins injection) and vaccinations (*Peste des Petits Ruminants* [PPR]) were carried out on the animals prior to mating and during the gestation period. These pregnant does were divided into four treatment groups, with four animals per replicate in a completely randomized design (CRD). Each in-doe was housed in a separate pen that was floored with cement and saw dust sprayed on the floor as bedding materials. The does were offered mixed forages, comprising mostly 80 % *Panicum maximum* (PM) (other forages include *Bambusa vulgaris*, oil palm fronds, *Calopogonium mucunoides*, *Centrosema pubescens*) as the basal diet throughout the experimental period and it was supplemented with a concentrate diet formulated with wet brewers' spent grain, palm kernel cake, wheat offal, bone meal, vitamin/trace mineral premix and salt at the fourth month of gestation. The experimental diets with brewers' dried grain with or without *Enterolobium cyclocarpum* (EC) leaves were introduced at the fifth month (day 121 onward) of gestation. The ingredients compositions of the experimental concentrate diets are shown in Table 2.1. Diet 1, the control diet contained 0.00 % *Enterolobium cyclocarpum* leaves (EC0), diet 2 had 7.50 % EC leaves (EC7.5), diet 3 consisted of 15.00 % EC leaves (EC15) while diet 4 contained 22.50 % EC leaves (EC22.5). The animals were fed at 6 % body weight (BW); the forage, the basal diet was fed at 3 % BW while the mixed concentrate ration was weighed and fed at 3 % BW. Does weight were gently taken each week and feed offered calculated and adjusted according to body weight gain. Clean drinking water was supplied at all times. This experimental phase was terminated 7 days post-partum.

2.2 Kids' management, colostrum harvesting and analyses

The dams kidded at the same time within 10 days. The kids were allowed to suckle their dams to obtain colostrum within 6 - 24 hours postpartum depending on the period of the day/night they kidded. Kids' birth weights were taken immediately after parturition. Within the 6 - 24-hour period postpartum, the dams were hand milked and colostrum samples obtained and taken to the laboratory for analyses. Colostrum samples were analyzed for lactose, total solids (TS), butterfat (BF), protein, other carbohydrates and ash. Solids-not-fat (SNF) and energy contents were calculated. Lactose was determined by the Marrier and Boulet (1959) method. Total solid was determined by the method of AOAC (1990). Butterfat (BF) was determined by the Roese-Gotlieb method (AOAC, 1990). Protein was determined by the micro Kjedahl method. The percentage nitrogen content was calculated and the value multiplied by the factor 6.38 to obtain the percentage protein contents. Ash was determined by drying a known weight of milk on a water bath, heated over a hot plate to char and then placed in a muffle furnace set at 540 ^{0}C to ash for about 2 hours (AOAC, 1990). Solids-not-fat (SNF) was calculated as the difference

between total solids (TS) and butterfat (BF) while milk energy Y (M/kg) was calculated using the multiple regression equation:
Y = 0.386F + 0.205 SNF – 0.236 (MAFF, 1975);
Where
F = fat,
SNF = solids-not-fat.

Table 2.1: Ingredients composition (% dry matter) of experimental diets containing EC leaves

INGREDIENTS	**T1 (EC0)**	**T2 (EC7.5)**	**T3 (EC15)**	**T4 (EC22.5)**
Enterolobium cyclocarpum	0.00	7.50	15.00	22.50
Wheat offal	60.00	60.00	60.00	60.00
Brewers' Dried Grain	10.00	10.00	10.00	10.00
Palm Kernel Cake	27.00	19.50	12.00	4.50
Bone meal	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50
Vitamins/Trace Mineral premix	0.50	0.50	0.50	0.50
Total	**100.00**	**100.00**	**100.00**	**100.00**

T1 (EC0) = Treatment 1 with 0 % *Enterolobium cyclocarpum* (EC) leaves. T2 (EC7.5) = Treatment 2 with 7.50 % EC leaves. T3 (EC15) = Treatment 3 with 15.00 % EC leaves. T4 (EC22.5) = Treatment 4 with 22.50 % EC leaves.

2.3 Colostrum mineral composition determination

The colostrum mineral compositions (calcium (Ca), phosphorus (P), magnesium (Mg), potassium (K) and sodium (Na)) were analyzed according to the methods of AOAC (2005). The Ca and Mg were burnt off in an atomic absorption spectrophotometer (AAS) and the intensity of their flame was measured at the appropriate wavelength, current and pressure. Potassium and sodium were read off in the flame photometer while phosphorus was measured calorimetrically using the vanado-molybdate reagent (AOAC, 2005).

Data analyses

Data obtained were subjected to analysis of variance (ANOVA) using the SAS (1999) software. Treatment means were separated by Duncan multiple range test option of the same software.

3.0 RESULTS AND DISCUSSION

3.1 Proximate composition of experimental diets

The proximate composition of diet containing graded levels of EC leaves fed to WAD does are presented on Table 3.1.

Table 3.1: Proximate composition (%) of experimental diets containing *Enterolobium cyclocarpum* leaves

Parameters	EC0	EC7.5	EC15	EC22.5	SEM
Dry matter	98.65[a]	95.23[b]	94.87[c]	94.11[d]	0.53
Crude protein	13.30[d]	14.88[c]	18.01[b]	20.53[a]	0.85
Crude fibre	3.89[c]	5.13[b]	5.99[a]	6.00[a]	0.26
Ether extract	1.33[d]	2.32[c]	2.80[b]	3.06[a]	0.20
Ash	5.63[c]	7.58[b]	8.86[a]	8.92[a]	0.40
Nitrogen free extract	75.85[a]	70.09[b]	64.34[c]	61.49[d]	1.66

[a – d] Means in the same row with different superscripts are significantly different ($p<0.05$). EC0 = 0 % *Enterolobium cyclocarpum* (EC) leaves. EC7.5 = 7.50 % EC leaves. EC15.0 = 15.00 % EC leaves. EC22.5 = 22.50 % EC leaves. SEM = Standard error of mean.

There were significant differences ($p<0.05$) in all the parameters across treatments. Dry matter was highest (98.65 %) in the EC0 diets and lowest (94.11 %) in the EC22.5. Nitrogen free extract followed the same pattern, being highest in Treatment 1 (75.85 %) and lowest in Treatment 4 (61.49 %). Significantly higher ($p<0.05$) concentrations of other proximate parameters (crude protein, crude fibre, ether extract and ash) were obtained in the EC22.5 diet. Crude protein (CP) was 13.30 % in EC0 diet and 20.53 % in EC22.5) diet. This CP range was within the range (14 – 18 %) recommended by NRC (1981) for lactating goats and above the minimum 8 % required for optimum rumen metabolism (Norton, 1998). The CP values obtained also corroborated the findings of other authors (Ogunbosoye and Babayemi, 2010; Ahamefule *et al.*, 2012; Tona *et al.*, 2015) who also fed lactating West African dwarf goats. Crude fibre was lowest (3.89 %) in diet EC0 and highest (6.00 %) in diet EC22.5. Ether extract was also lowest in diet EC0 (1.33 %) and was significantly highest in diet EC22.5 (3.06 %). Ash concentration of 8.92 % was obtained in diet EC22.5 and this was significantly different ($p<0.05$) from concentrations of 5.63 % and 7.58 % for diets EC0 and EC7.5 respectively. Ash contents (8.86 %) in the colostrum of does fed diet EC15.0 was statistically similar to EC22.5.

3.2 WAD does colostrum composition

The composition of the colostrum of WAD does fed diets with or without *Enterolobium cyclocarpum* leaves are presented in Table 3.2.

Table 3.2: Colostrum composition (%) of WAD does fed concentrate diets with or without *Enterolobium cyclocarpum* leaves

Parameters	**EC0**	**EC7.5**	**EC15**	**EC22.5**	**SEM**
Total solids	17.11[b]	14.53[d]	15.78[c]	20.22[a]	0.64
Lactose	5.13[b]	4.12[c]	4.11[c]	5.64[a]	0.20
Protein	8.05[a]	5.25[d]	6.55[c]	7.65[b]	0.33
Butter fat	1.53[c]	1.89[b]	3.94[a]	1.44[d]	0.31
Solids-not-fat	15.58[b]	12.64[c]	11.84[d]	18.78[a]	0.82
Ash	0.86[b]	0.73[d]	0.92[a]	0.82[c]	0.02
Energy (MJ/kg)[*]	3.55[c]	3.09[d]	3.71[b]	4.17[a]	0.12

[a – d] Means in the same row with different superscripts are significantly different ($p<0.05$). EC0 = 0 % *Enterolobium cyclocarpum* (EC) leaves. EC7.5 = 7.50 % EC leaves. EC15.0 = 15.00 % EC leaves. EC22.5 = 22.50 % EC leaves. SEM = Standard error of mean.
[*]Calculated.

Significant differences ($p<0.05$) were observed in the colostrum proximate composition across dietary treatments. The total solids (TS) were 14.53 % in the colostrum of does fed diet EC7.5 and 20.22 % in the colostrum of does fed diet EC22.5. The TS values for colostrum of does fed EC7.5 (14.53 %) and EC15 (15.78 %) were lower than does fed the EC0 (17.11%). Total solids concentrations in colostrum of WAD does fed EC22.5 (20.22%) were significantly ($p<0.05$) higher to those on diet EC0. The TS concentrations (14.53 – 20.22) in this study was in tandem with the TS values (13.68 – 19.56 %) reported by Ahamefule *et al.* (2004) in the colostrum of WAD does analyzed from day 1 to 6 postpartum. The contents of TS in this study also agreed with the mean of 19.06 % published by Egbowon *et al.* (2005) in the colostrum of WAD does managed intensively. The range for TS obtained in this study was also within the range (17.37 – 18.52) in the colostrum of WAD as reported by Anya and Ozong (2018). Also, the range for TS (14.53 – 20.22%) obtained in this milk colostrum was also in the TS range (17.03 – 18.19 %) found in the colostrum of WAD does as authored by Olaniyi *et al.* (2018).

Lactose concentration in the colostrum of does fed EC22.5 was the highest (5.64 %) and was significantly different ($p<005$) from the lowest concentration (4.11 %) in the colostrum of does fed the EC15 diet. The concentration of lactose in the colostrum of does fed diet with 7.5% EC leaves inclusion (4.12 %) did not differ significantly ($p>0.05$) from the concentration (4.11%) in the colostrum of does fed diet 3 with 15% EC leaves inclusion. The colostrum lactose concentration (4.11 – 5.64%) obtained in this study differed with the higher values of 2.28 – 2.30 % published by Anya and Ozung (2018) in WAD colostrum. The disparities may be as a result of the varying diets quality (Anya and Ozung, 2018). The diets offered in this study were quite high in nitrogen free extract (61.49 – 75.81 %; Table 3.1) than the range of nitrogen free extract values (51.38 – 54.62 %) reported by Anya and Ozung (2018) in their diets.

Colostrum protein was significantly ($p<0.05$) highest (8.05 %) in diet EC0 and lowest (5.25 %) in diet EC7.5. The protein concentrations differed significantly across treatments with values of 6.55 % and 7.65 % obtained in the colostrum of does fed EC15 and EC22.5 diets respectively. Protein contents of 7.65 % were obtained in the colostrum of does fed EC22.5, which was the highest among the treated groups (Treatment 2 – 4). Higher concentrations of protein in the colostrum translate to higher concentrations of antibodies for the development of passive immunity by the kids. Ahamefule *et al.* (2004) reported similar range of protein (4.90 – 6.79 %) in the colostrum of WAD does obtained 1 – 6 days postpartum. This protein concentrations corroborated the mean protein value of 6.84 % obtained by Egbowon *et al.* (2005) in the colostrum of WAD does managed intensively. Colostrum protein concentration obtained in this study also agreed with the range of 5.09 – 5.41% and 6.77 – 7.40 %) reported by Anya and Ozung (2018) and Olaniyi *et al.* (2018) respectively in the colostrum of WAD goats. Concentrations of crude protein (CP) of the diets (13.30 – 20.53%; Table 3.1) used in this study were higher than the CP contents of the diets used by Anya and Ozung (2018), thus enhancing colostrum protein constituents.

The butter fat (BF) concentrations in the colostrum of WAD does differed significantly ($p<0.05$) across treatments and was 1.44 % in EC22.5 diet and 3.94 % in EC15 diet. These BF values were concurrent with the values (3.12 – 3.52%) published by Anya and Ozung (2018). However, BF concentrations obtained in this study were quite low, compared to values of 6.17 – 10.89 % obtained by Ahamefule *et al.* (2004) for WAD does colostrum. The disparity is likely due to the differences in the nutrient composition of the concentrate ration fed the does.

The composition of solids-not-fat (SNF) in the colostrum of WAD does differed significantly ($p<0.05$) and was highest (18.78 %) in EC22.5 diet and lowest (11.84%) in diet EC15. The range of values for colostral SNF (14.16 – 14.54%) reported by Anya and Ozung (2018) were within the range obtained in this study. The SNF concentrations are generally affected by diet quality.
The percentage ash concentrations in the colostrum of WAD does was significantly different ($p<0.05$) across treatment with values of 0.86, 0.73, 0.92 and 0.82 % obtained in the colostrum of does fed EC0, EC7.5, EC15.0 and EC22.5 diets respectively, concentrations of colostrum ash was in the same proportion (0.78 – 0.91%) in the colostrum of WAD analyzed by Anya and Ozung (2018).

The colostrum energy contents differed significantly ($p<0.05$) across treatment, being 3.09 MJ/kg in diet EC7.5 and 4.17 MJ/kg in diet EC22.5. BF and SNF are the major boasters of colostrum energy contents (MAFF, 1975; Anya and Ozung, 2018). The colostrum energy contents in this study corroborated the energy values (2.30 – 4.14 MJ/kg) obtained by Ahamefule *et al.* (2004) in the colostrum of WAD does. The range for colostrum energy obtained in this study was within the range (3.87 – 4.30 MJ/kg) reported by Anya and Ozung (2018) for the colostrum of WAD does. Energy is vital for optimal kids' growth.

Colostrum mineral composition
The mineral concentration (mg/100g) in the colostrum of WAD does fed concentrate diet containing graded levels of EC leaves are as shown on Table 3.3.

Table 3.3: Mineral compositions (mg/100g) of colostrum of WAD does fed concentrate diet containing graded levels of *Enterolobium cyclocarpum* leaves

Parameters	**EC0**	**EC7.5**	**EC15.0**	**EC22.5**	**SEM**
Calcium	43.88[b]	30.07[d]	44.36[a]	39.71[c]	1.73
Magnesium	20.36[b]	19.21[c]	23.59[a]	19.76[c]	0.52
Phosphorus	6.30[c]	6.01[d]	8.09[b]	9.41[a]	0.42
Potassium	5.68[a]	3.72[d]	5.28[b]	4.58[c]	0.23
Sodium	14.81[c]	39.07[a]	18.24[b]	14.51[d]	3.06
Iron	0.12	0.09	0.11	0.13	0.01

[a – d] Means in the same row with different superscripts are significantly different ($p<0.05$). EC0 = 0 % *Enterolobium cyclocarpum* (EC) leaves. EC7.5 = 7.50 % EC leaves. EC15.0 = 15.00 % EC leaves. EC22.5 = 22.50 % EC leaves. SEM = Standard error of mean.

Colostrum concentrations of calcium (Ca), magnesium (Mg), phosphorus (P), potassium (K) and sodium (Na) was significantly different ($p<0.05$) across treatments. Concentrations of Ca were 30.07 mg/100g in the colostrum of does fed EC7.5 and 44.36mg/100g in the colostrum of does fed EC15.0. The Ca contents in this study were low compared to the range of 138.20 – 152.63 mg/100ml (Bawala *et al.,* 2006) and 113.67 – 123.67 mg/100g (Olaniyi *et al.*, 2018) reported for the colostrum of WAD does fed diets containing mineral from different sources. Non-concurrent values may be due to diet quality (mineral supplementation of the diet).

Colostrum Mg compositions of 20.36, 19.21, 23.59 and 19.76 mg/100g which were significantly different ($p<0.05$) across treatments were obtained in colostrum of does fed diets EC0, EC7.5, EC15.0 and EC22.5 respectively. Concentrations of colostrum Mg obtained in this study was lower than the range of 27.67 – 56.45 mg/100ml obtained in the colostrum of WAD does (Bawala *et al.*, 2006). However, the range of colostrum Mg obtained in this study was higher than the range of 12.30 – 12.93 mg/100g for the colostrum of WAD does (Olaniyi *et al.*, 2018) and the range of 17.20 – 17.70mg/100ml for the colostrum of WAD does fed *Cynodon nlemfuensis* forage basal diet supplemented with concentrate diets containing urea or groundnut cake (Ojoawo and Akinsoyinu, 2014). This corroborated the fact that colostrum Mg contents are influenced by diet quality.

Colostral P obtained in this study differed significantly ($p<0.05$) across treatment and was 6.01mg/100g in colostrum of does fed diet EC7.5 and 9.41mg/100g in colostrum of WAD does fed EC22.5. These were quite lower than 107.02 – 113.45 mg/100ml and 76.33 – 84.67 mg/100g obtained by Bawala *et al.* (2006) and Olaniyi *et al.* (2018) respectively in the colostrum of WAD does used for their study.

Constituents of K in the colostrum of WAD does differed significant ($p<0.05$) across treatments with values of 5.68, 3.72, 5.28 and 4.58 mg/100g in colostrum of does fed diets EC0, EC7.5, EC15.0, and EC22.5 respectively. These compositions of K obtained were equally quite lower

than the range (178.45 – 186.78 mg/100ml) reported in the colostrum of WAD does fed diets with varying mineral sources (Bawala *et al.*, 2006) and 154.7 – 162.50 mg/100ml for the colostrum of WAD does fed *Cynodon nlemfuensis* forage basal diet supplemented with concentrate diets containing urea or groundnut cake (Ojoawo and Akinsoyinu, 2014). The non-concurrent values may be due to diet quality.

Sodium (Na) concentrations in WAD does colostrum differed significantly ($p<0.05$). Concentrations of Na were 14.51mg/100g in colostrum of does fed EC22.5 diet and 39.07mg/100g in colostrum of does fed EC7.5. The concentrations of colostrum Na obtained were lower than the range of 97.4 – 99.2 mg/100ml published for the colostrum of WAD does fed *Cynodon nlemfuensis* forage basal diet supplemented with concentrate diets containing urea or groundnut cake (Ojoawo and Akinsoyinu, 2014). Differences in values may be attributed to diet type.

Concentrations of colostrum Iron (Fe) did not differ significantly ($p>0.05$) across treatment. Values of 0.12, 0.09, 0.11 and 0.13mg/100g were obtained in colostrum of WAD does fed EC0, EC7.5, EC15.0, and EC22.5 respectively. The range of colostrum Fe obtained in this study does not agree with the range of 0.23 – 0.32 mg/100g reported for the colostrum of WAD does with increased dietary mineral intake (Olaniyi *et al.*, 2018) likely due to the different diets fed the animals.

Concentrations of calcium in this study were higher than potassium and other minerals assayed. This corroborated the reports of Ahamefule *et al.* (2012) that also obtained a higher concentration of calcium in the milk of WAD does. Thus factors that may inter play, resulting in variations in colostrum mineral concentrations include the individual genetic makeup, seasonal variations in pasture mineral and nutritional composition as well as feed quality.

4.0 CONCLUSION

Concentrations of total solids, lactose, proteins, solids-not-fat and energy were maximum in the colostrum of WAD does fed a concentrate diet that contained 22.50 % EC leaves (E22.5). The higher concentration of proteins with higher percentage of antibodies will confer passive immunity to the kids. Feeding of *Enterolobium cyclocarpum* leaves favoured the production of more calcium, magnesium, phosphorus and sodium than the diet without *Enterolobium cyclocarpum* leaves. Butter fat on the other hand was highest in the colostrum of does fed diet containing 15.0 % *Enterolobium cyclocarpum* leaves.

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