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EFFECTS OF SEASON, LIVE BODY WEIGHT AND Hb GENOTYPE ON UDDER MORPHOMETRY AND PROGESTERONE LEVELS AT DIFFERENT STAGES OF PREGNANCY IN GOATS

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ABSTRACT

This study was conducted to determine the effects of season, live weight and Hb genotype on udder morphometry and progesterone level at different stages of pregnancy in goats. A total of one hundred (100) pregnant does from two breeds of goats (50 each from Sahel and Red Sokoto) were sampled from the Maiduguri abattoir during two seasons (Cold dry and hot dry). Data on live weight, udder morphometry, Hb genotype and progesterone level were collected at different stages of pregnancy (36 – 75, 76 – 85 and >85 days of gestation). Results indicated similarities (p>0.05) among all variables measured during 36 – 75 days of gestation across different seasons, body live weights and Hb genotypes while, during 76 – 85 day, only live weight significantly (p<0.05) influenced progesterone level. Heavier animals had the higher value of 48.29ng/ml. At the latter stage of pregnancy (>85 days), Hb genotype significantly (p<0.05) influenced udder circumference with AA genotype having the highest (21.45cm) though not significantly difference from that of AB genotype. Hot dry season also recorded significantly (p<0.05) higher udder length (14.30 ± 0.57cm) and udder circumference (21.22 ± 0.86cm) compared to the cold season with corresponding values of 10.23 ± 0.58cm and 18.65 ± 0.88cm. It was concluded that season, live weight and Hb genotype had no effect on udder morphometry and progesterone level at early stages of gestation. However, the effects of these factors were noticed at the mid and late stages.

Key Words: Hb Genotype, goats, progesterone, udder

INTRODUCTION

The udder is a very important gland in reproducing animals for milk production. Several studies have confirmed that udder characteristic are important determinants of milk yield and ease of milking or milking ability in dairy animals (Akpa *et al*., 2002; Rogers and Spencer, 1991). Udder trait has been shown to be influenced or affected by several factors such as genotype, breeding and environment (Milerski *et al.*, 2006). The knowledge of the relationships between these traits can be utilized in the design of breeding programmes to improve quantity and quality of breeding does (Shook, 1989). There is rising interest in udder morphological traits of small ruminants with emphasis on the relationship of the traits with genotype and other factors that affect them (Fernandez *et al.*, 1995). A major role of the endocrine system is to synchronize udder development and function with the reproductive state of the animal and the levels of only a small number of reproductive hormones, including estrogen (E), progesterone (P), placental lactogen (PL), prolactin (PRL), and oxytocin, change with reproductive state and all have direct actions on the udder development (Terzano *et al*., 2012). Several studies in ruminants have also linked different haemoglobin types to production traits and differences in frequency of genes among locations (Akinyemi and Salako, 2010; Al-Samarrae and Yaunis, 2011). Haemoglobin polymorphism is reported to have variants and these variants have been reported to be associated with environmental adaptability (Peters *et al*., 2004). The objective of the study was to determine the effects of season, live weight and Hb genotype polymorphism on udder morphometry and progesterone levels at different stages of pregnancy in two breeds of Nigerian indigenous does.

MATERIALS AND METHODS

Borno State is located on latitude 11.5^{o} E and longitude 14 ^{o} N; it covers an area of 61,435 square kilometres which is about 12 per cent of the total area of the country. It is situated in the North-eastern corner of the country. Maiduguri, the capital city of Borno State falls under the Sahel region of West Africa. It has a very short period of rainfall (3-4 months) with an average of 645.9 mm/annum, and a long dry season of about 8-9 months. The wet season starts from June and ends in September.

Ambient temperature could be as low as 19^0 C during the dry cold season, and as high as 44^o C or more during the hot dry season (BOSHIC, 2007)

Animals used for the study were obtained from the Maiduguri abattoir which is situated opposite the Maiduguri cattle market. A total of Fifty (50) females from each breed of goats (Sahel and Red Sokoto) were randomly selected from pregnant does presented for slaughter. Data were collected during the cold dry and hot dry seasons. Gestation periods of the does were classified as follows; 36-75 days, 76-85 days and >85 days of gestation.

The live weight was taken for each pregnant goat doe using a weighing scale (Diamond) in kilograms (kg). Measurements of udder length (UL) and udder circumference (UC) were taken by means of a flexible tape rule as described by James and Osinowo (2004). Blood samples (2-5ml) were collected in anticoagulant tube through the jugular vein. The blood samples were then transferred to the laboratory for processing immediately after collection. At 1 to 2hrs after blood samples collection, sera were separated by centrifugation at 3000 rpm for 30 min and 4^0C, transferred into 1.5ml Eppendorf tubes, and stored at -20^0C until assaying for Progesterone. Progesterone analysis was conducted at the haematology laboratory of the University of Maiduguri Teaching Hospital. Haemoglobin genotypes were determined by agarose gel (1%) electrophoresis as described by Pal and Mummed (2014) at the Animal Science laboratory of the University of Maiduguri.

The data generated were subjected to analysis of variance using the General Linear Model (GLM) of IBM SPSS 20.0 (2011). Significant differences in Means were separated using Duncan's Multiple Range Test (DMRT) (Duncan, 1955).

RESULT AND DISCUSSION

Table 1 shows the effect of season, live weight and Hb genotype on udder morphometry and progesterone levels of goats at different gestation levels. Udder length and circumference were not significantly ($p<0.05$) influenced by season, live weight and Hb genotype during the earlier days (36 – 75 and 76 - 85) of gestation. This confirms the report of Yakubu *et al.* (2014) and Shettima *et al.* (2019) that Hb genotype had no influence on morphometric characteristics of goats. However, during the latter days, (> 85) season significantly ($p<0.05$) influenced udder length and circumference with does having higher means during the dry hot season compared to dry cold. Hb genotype also significantly ($p<0.05$) influenced udder circumference during this period with homozygous AA and heterozygous AB having a greater mean compared to the homozygous BB. The means of udder length in the present study was below 14.13±0.10, 16.07±0.32 and 12.57±0.36 for lactating red Sokoto, Sahel and WAD goats respectively reported by Zarahdeen *et al.* (2008) while that of udder circumference was also lower than what Zarahdeen *et al.* (2008) reported.

Level of progesterone in the blood was not affected by season, live weight and Hb genotype in does during the gestation period recorded except during 76 – 85 days of gestation when progesterone level was significantly influenced by doe body weight with the heavier (21 – 25kg) does having higher progesterone level. The non-significant effect of season on progesterone levels is contrary to the observation of Sogorescu *et al*. (2012) who reported significant ($p<0.05$) effect of season on progesterone level in Carpathian goats. The difference observed may be as a result of breed, level of production and environmental differences. The mean progesterone level in present study was above the result reported by Alwan *et al.* (2010) in Iraqi goats for 1^{st} Month (8.10±0.50), 2^{nd} Month (7.05±0.71) and 3^{rd} Month (19.30±1.50) but within the range of 30.34 - 20.72 for 4^{th} and 5^{th} Month respectively. Alwan *et al.* (2010) further noted increase in level of progesterone as the gestation advances and finally drops at the 5^{th} Month which is in consonance with the present study in the Nigerian goat. Variable progesterone level in pregnant sheep and doe was reported by Hybring *et al* (1999) and Jarell and Dzink (1999). There were significant differences ($P<0.05$) between progesterone levels of doe of different live weights, the heavier does had higher level of progesterone. Similar observation was reported by Islam *et al.* (2014) in black Bengal goat.

CONCLUSIONS

It was concluded that season, live weight and Hb genotype had no effect on udder morphometry and progesterone level at early stages of gestation. However, at the mid and late stages, LBW and HB genotype had effect on level of progesterone, udder circumference and udder length.

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Table 1: Effects of Season, Live Body Weight and Hb Genotype on udder morphometry and progesterone level at 36-75 days of gestation

Parameters		UL±SE (cm)	UC±SE (cm)	LOP±SE (ng/ml)
		36-75 days of gestation		
Hb Genotype	AA	12.67±0.93	20.86±1.20	10.25±8.82
	AB	12.29±1.23	22.94±2.02	22.81±9.92
	BB	13.30±1.28	24.33±2.39	19.96±11.75
Body weight	10 – 15kg	10.91±0.50	19.70±0.94	13.87±4.60
	16 – 20kg	12.87±1.28	20.99±1.75	15.06±8.57
	21 – 25kg	15.45±2.49	27.43±4.67	24.09±22.91
Season	Dry Cold	12.88±0.90	22.13±2.09	15.04±8.31
	Dry Hot	12.85±1.25	23.29±2.09	20.34±10.21
		76-85 days of gestation		
Hb Genotype	AA	11.91±0.93	22.88±1.37	18.24±5.82
	AB	12.53±1.23	24.67±1.81	33.76±7.66
	BB	10.59±1.41	20.46±2.07	18.42±8.78
Body weight	10 – 15kg	10.34±0.88	20.35±1.29	12.93±5.47^{b}
	16 – 20kg	12.58±1.25	20.66±1.83	9.20±7.79^{b}
	21 – 25kg	14.27±1.77	26.99±2.61	48.29±11.08^{a}
Season	Dry Cold	10.18±0.88	20.27±1.30	18.36±5.51
	Dry Hot	12.74±1.25	25.07±1.84	28.59±7.83
		>85 days of gestation		
Hb Genotype	AA	11.64±0.52	19.80±0.79^{a}	11.94±5.8
	AB	12.44±0.88	21.45±1.33^{a}	6.33±9.75
	BB	11.22±0.88	18.55±1.33^{b}	25.91±9.75
Body weight	10 – 15kg	10.98±0.68	17.87±1.03	14.07±7.56
	16 – 20kg	12.56±0.55	22.00±0.83	15.38±6.13
	21 – 25kg			
Season	Dry Cold	10.23±0.58^{b}	18.65±0.88^{b}	9.49±6.47
	Dry Hot	14.30±0.57^{a}	21.22±0.86^{a}	19.96±6.34

a,b =column with different superscripts are significantly different (p > 0.05), ±SE standard error, UL= udder length, UC= udder circumference, LOP= level of progesterone, LBW= live body weight, AA and BB = homozygote, and AB heterozygous