INFLUENCE OF FEED TYPE ON THE HORMONAL PROFILE OF DOES AT VARIOUS PHYSIOLOGICAL STAGES

WABA Y. E
FEDERAL POLYTECHNIC BALI, TARABA STATE

ABSTRACT
The study evaluated the influence of feed on the hormonal profiles of West African Dwarf (WAD) and Sahel goats at the Teaching and Research Farm of the Federal Polytechnic Bali, Taraba State. This is to determine the hormonal profile of does at various physiological statuses (puberty, conception and lactation). A total of 16 WAD and 16 Sahel foundation stock of both sexes were used for the study which lasted for 26 months. The animals were fed Gmelina + Cassava peel (Gm+Cpm), Gmelina + cowpea husk (Gm+Cph) Ficus + Cassava peel (Fs+Cpm) and Ficus+Cowpea husk (Fs+Cph) as experimental treatments diets in addition to basal grazing. Out of the stock population, in each treatments group, 2 adults and 8 young females at pubertal stage were assessed. To determine the hormonal level, 5ml of blood was collected from the jugular vein, and samples were then centrifuged at 3000 rpm for 15 minutes. The serum was then decanted into plastic tube kept at -20 oC. At the onset, the reagents, serum reference calibrators and specimen to be used in the assay were kept at room temperature (20-27 OC). known quantity (0.025 ml) 25 µL of each of the appropriate serum reference calibrator, control or specimen were separately pipette into their assigned micro plate wells in duplicates. Both breed and treatment did not affect significantly any of the hormones investigated. However, the trend showed higher levels for the Sahel goats for the three hormones. In addition, for testosterone there was seemingly a lower value for diet with Cpm. In conclusion, both progesterone and oestradiol in pregnant and lactating does did not vary with breed. However, the two varied statistically with diet and physiological status, and of course the pregnancy stage had higher hormonal values than lactation. Also, at puberty, hormonal level did not vary with breed and diet. However, the trend showed higher levels in Sahel goats and also higher oestradiol for Gm but lower values of testosterone for Cpm diets.
Keywords: Progesterone, Oestradiol, Testosterone, Pregnancy, Lactation, Puberty, Hormonal assay

INTRODUCTION

Low animal protein availability is partly due to low level of animal production because of subsisting neglect of the livestock sub-sector in the context of national policies, dated back to the colonial era (Ozo, 2004). Increase in supply of animal products could be easily achieved by higher ruminant population as suggested by Devendra and McLeroy (1982). The domestic goat *(Capra hircus, L.)* provides a range of useful products including meat, milk, skin and hair. They survive on grass and available browse in harsh environments. Goat production over the years has been a major means of improving the livelihoods of peasant farmers, reducing poverty and ensuring food security (Abdel-Aziz, 2010). Productivity however remained low and subsistent. Dominique *et al*. (2008) had also reported that, variations in nutrition and energy balance, affect reproductive activities at all stages of reproduction.

Reproduction is one of the main factors of production and are affected by a range of factors including, socio-sexual cues, photoperiod, energy balance etc. In temperate breeds, photoperiod is a very potent factor. Energy balance is also a regulator of reproductive functions. Variations in nutrition and energy balance affect reproductive cycle at almost all the stages (Dominique *et al.*, 2008). In addition to the short-term effects of nutrition on reproductive activity of parents, it also has long-term consequences on that of the future generations (Fowden *et al.*, 2006). While the factors (including limiting factors) of production are fairly well known amongst some goat populations, only scanty information is available on them in the study area, especially those controlling reproduction. Therefore, the objective of the study was to determines the hormonal profile of does at various physiological statuses (puberty, conception and lactation).

Methodology

The physiological stages considered were the puberty in young ones and, conception and lactation in adults. In each treatments group, 2 adults and 8 young females at pubertal stage were assessed.

Hormonal Assay: For hormonal assay, an initial sample (5 ml of blood) was collected from the jugular vein of the animals. The samples were then centrifuged at 3000 rpm for 15 minutes. The Supernatant was decanted into fresh test tubes and stored at -20 °C to be used for hormone assay. Subsequent assays were carried out by skilled/trained professionals as described by Engeleand *et al*, (1997).

Progesterone determination: The micro plate enzyme immune assay procedure (Abraham, 1981) was used. At the onset, the reagents, serum reference calibrators and specimen to be used in the assay were kept at room temperature (20-27 ^{O}C). known quantity (0.025 ml) 25 µL of each of the appropriate serum reference calibrator, control or specimen were separately pipette into their assigned micro plate wells in duplicates. Subsequently, 0.050 ml (50 µL) of progesterone enzyme reagent was added to each well and swirled gently for 10-20 seconds to mix. Furthermore, 0.050 ml (50 µL) of progesterone biotin reagent was added and again swirled gently for 10-20 seconds. The wells were then covered and incubated for 60 minutes at room temperature. The contents of the micro plate wells were then discarded (Engeleand *et al*.,1997).

Oestradiol: The procedure for Oestradiol determination was similar to that of progesterone except for minor differences e.g. the use of Oestradiol biotin and enzyme (Engeleand *et al*.,1997)

Testosterone: Also microplate enzyme immune assay procedure (Chen *et al*., 1991) was used. Before proceeding with the experiment, the reagents, serum reference calibrators and specimen to be used in the assay were kept at room temperature (20-27^{0}C). Appropriate quantity of 0.35ml (35µL) of the serum reference calibrators, control or specimens were separately pipette into their assigned micro-plate wells in duplicates. Quantities of 0.05ml (50 µL) of testosterone enzyme reagent were added to each well. It was thoroughly mixed for 30 second. Subsequently, 0.100 ml (100µL) of testosterone conjugate reagent was added into each well and incubated at 37 ^{O}C for 90 minutes. The absorbance was then observed for changes in colours from blue to yellow completely and read at 450nm with a micro titer well reader within 15 minutes. The testosterone concentration was subsequently determined using a computer software and appropriate averages determined.

RESULTS AND DISCUSSION

The least squares mean of hormonal profiles of female goats on different feed during pregnancy and lactation are shown in Table 1. The overall progesterone and oestradiol levels were 12.38 ng/ml and 136.83 pg./mL respectively. The progesterone and oestradiol levels did not differ significantly with breed. Similarly, oestradiol level did not vary significantly with diets, however, progesterone significantly ($P<0.01$) varied. Diets with Cph appeared to have higher levels of progesterone and oestradiol. Animals fed on Fs+Cph had highest (19.25 ng/mL) progesterone level, while those on Gm+Cpm had lowest value (6.88 ng/mL). The two hormonal levels varied significantly($P<0.01$) with physiological status, with the pregnant stage showing higher values in each case.

Table 2 shows the least squares mean of hormonal profiles of WAD and Sahel kids at pubertal stage. The overall hormonal levels were progesterone (6.50 ng/ml), oestradiol (11.15 pg/ml) and testosterone (2.08 pg/ml). Both breed and treatment did not significantly affect any of the hormonal profile investigated. However, the trend showed higher levels for the Sahel goats for the three hormones. In addition, for testosterone there was seemingly a lower value for diet with Cpm.

In the present study, oestradiol did not vary with diet. This is an indication that the diet supplied elicits the same amount of oestradiol production in the two breeds. However, the variation in progesterone levels by breed is an indication that the hormone may be more sensitive to diet change than oestradiol. Progesterone however prepares the uterus for implementation of fertilized ovum and maintenance of pregnancy. There should be careful choice of diet during these periods such that it does not interfere with implantation and continuity of pregnancy. Indeed, diets with Cph appeared to result in higher progesterone indicates that feeding of the ingredient should be encouraged during pregnancy. Animals maintained on pasture for sources of feed were also evaluated for progesterone and oestradiol levels in their blood during pregnancy period (Khanum *et al*., 2008). It was reported that, after conception, higher progesterone levels (4.3–11.0 ng/ml) were observed and maintained

throughout the gestation period and thereafter, declined rapidly at the 19th day pre-partum, reaching 0.8-1.0 ng/mL on the day of parturition (Khanum *et al*., 2008). It was further stated that, the mean maximum progesterone level during gestation was 10.9±1.3 ng/ml.

Table 1: Least square means of hormonal profile of West African Dwarf and Sahel goats during pregnancy and lactation

Variables	N	Progesterone (ng)	Oestradiol (pg)	Reference Values
Overall	48	12.38	136.83	
Breed		Ns	Ns	
WAD	24	9.76	147.05[a]	7.7pg/ml
Sahel	24	14.99	126.60[a]	7.15pg/ml
Treatment		**	Ns	
Gm+ Cpm	12	6.88[b]	116.04	
Gm+ Cph	12	12.64[ab]	167.87	
Fs+ Cpm	12	10.74[ab]	115.62	
Fs+ Cph	12	19.25[b]	147.88	
Physiological stage		**	**	
Pregnancy	24	18.86[a]	165.88[a]	0.8-270pg/ml
Lactation	24	5.90[b]	107.78[b]	1.5-15.5ng/ml
Reference Values		4.43ng/ml	57.96pg/ml	

(P<0.01), a,b,c=means in a column bearing the same superscripts are statistically similar, WAD=West African Dwarf goat, Gm=*Gmelina arborea*, Fs= *Ficus sycamores*, Cpm=Cassava peel meal, Cph=Cowpea husk, N=sample size, ng=nanogram/ml, pg=pictogram/ml, ns=not significant. **Source of reference values (Boscos *et al*., 2003).

On the other hand, estradiol profile, remained at lower concentrations of 0.8±0.1 to 2.7± 0.02pg/mL, for 30 days after conception and then gradually increased up to 38.2± 1.23pg/ml on day-50 (Khanum *et al*., 2008). Then it kept increasing and attained maximum levels (270.0±13.0 pg./ml), at day-141 of pregnancy and dropped again to basal values within 1-2 days postpartum. Progesterone and estrogen are both more related to pregnancy than lactation (Yahi *et al*., 2017). This agrees with the findings in this study that the two hormones were both higher during pregnancy than lactation and agrees with Khanum *et al,* (2008).

Table 2: Means of hormonal profile of WAD and Sahel Doe goats at pubertal stage

Variables / Feeds	N	Progesterone (ng/mL)	Oestradiol (pg/mL)	Testasterone(pg/mL)
Overall	24	6.50	11.15	2.08
Breed	Ns	Ns	Ns	Ns
WAD	12	4.48	5.78	0.84
Sahel	12	8.51	16.53	3.32
Treatment	Ns	Ns	Ns	Ns
Gm+ Cpm	6	5.88	14.47	0.92
Gm+ Cph	6	8.17	12.65	4.43
Fs+ Cpm	6	1.55	8.90	0.35
Fs+ Cph	6	10.38	8.60	2.62

N=sample size, WAD=West African Dwarf, Gm=*Gmelina arborea*, Fs=*Ficus sycamores*, Cpm= Cassava peel meal, Cph= Cowpea husk, ns=not significant. ng=nanogram /ml, pg=pictogram/ml.

Also in this study, progesterone, oestradiol and testosterone levels did not vary statistically due to breed and feed at puberty. In addition, progesterone and oestradiol hormones had lower values than during pregnancy and lactation. All the three hormones are mainly for reproduction; puberty is just the onset of reproduction. It is probable that at this stage, the hormones started secreting in

preparatory to full reproduction (Abdelrahman *et al*., 2019). Therefore, these hormones would not be as higher as during the full reproductive (including the lactation) stages. At this stage (puberty) since the hormones just started to be produced and may only be low in quantity in the body, the hormones are not expected to be altered much by the factors considered in this study. The seeming higher values in Sahel (not significant though) than WAD at puberty may just be little indication of breed difference. Breed variations between them are expected being of different genetic makeup (Abdelrahman *et al*., 2019)

CONCLUSION

In conclusion both progesterone and oestradiol in pregnant and lactating does did not vary with breed. However, the two varied statistically with diet and physiological status, and the pregnancy stage had higher hormonal values than lactation. Also, at puberty, hormonal profile did not vary with breed and diet. However, the trend showed higher levels in Sahel goats and also higher oestradiol for Gm but lower values of testosterone for Cpm diets.

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