EFFECT OF DURATION OF FEEDING ON SCROTAL CIRCUMFERENCE, SEMEN QUALITY AND SPERM MORPHOLOGY CHARACTERISTICS OF RED BUCKS FED WHOLE COTTONSEED AND COTTONSEED CAKE

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ABSTRACT
A study was conducted to evaluate the effect of duration of feeding on semen quality of Red Sokoto bucks fed whole cottonseed and cottonseed cake. A total of twenty-four (24) healthy Red Sokoto bucks were randomly allocated to six dietary treatments in a completely randomized design. The treatments contained 10, 20 and 30% inclusion levels of either whole cottonseed (WCS) or cottonseed cake (CSC) in diets which were fed to the bucks over a period of 98 days after a 14-day adjustment period. Duration of feeding had significant (P<0.05) effect on sperm morphological abnormalities such as detached head, coiled tail, free tail, cytoplasmic droplets, dag defects and stunted tail which increased and decrease from the 2nd to 12th week. It was therefore concluded that bucks fed diets with CSC performed better than WCS and that up to 20% of CSC can be fed to breeding bucks whereas WCS should not be fed to breeding bucks except at very low levels (10%) as it negatively affects semen quality of Red Sokoto bucks.

Keywords: red sokoto bucks, treatment diet, semen quality and cottonseed

INTRODUCTION
The efficiency of sperm production, libido and quality of sperm tend to remain uniform throughout the reproductive life of an animal but may be significantly altered by age, nutrition, environment, health status, drugs, and chemicals (Togun and Egbunike, 2006. The plane of nutrition of an animal can affect libido and quality of semen produced as well as age of attaining puberty and stimulation of the hypothalamus (Hunderra, 2004). Ruminants with functioning rumens, are believed to have the capacity to detoxify gossypol; their ability to metabolically tolerate gossypol coincides with the development of rumen function (Prieto *et al*., 2003). The mechanism of gossypol detoxification by ruminants is believed to be via its binding to soluble protein and therefore the bond form is resistant to enzymatic digestion (Prieto *et al*., 2003; Mena *et al*., 2004).

MATERIALS AND METHODS
Experimental Site
The study was carried out at the Teaching and Research Farm, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria, Kaduna state, Nigeria. Zaria is located on latitude $11^0$33'N and longitude $7^0$42'E. Annual rainfall in this area ranges from 1102 to 1904mm and lasts from late April or early May to mid-October. The site is situated within the Northern-Guinea Savannah zone of Nigeria at an altitude of 610 mm above sea level (Ovimaps, 2015).

Experimental diets and Design
The experimental diets containing 14% CP (Table 1) were fed to the bucks at 3% per kg body weight every morning with clean fresh water provided *ad libitum*. At the end of the adjustment period, the bucks were randomly allocated to six dietary groups of four animals per group. Each group constituted a treatment and each buck within a group was a replicate in a completely randomized design with the treatments consisting of either whole cotton seed (WCS) included at 10, 20 and 30% or cottonseed cake (CSC) included at 10, 20, and 30% levels.

Table 1: Composition of experimental diets fed to the bucks

	Inclusion levels of whole cottonseed and cottonseed cake (%)					
			WCS	CSC		
Ingredients	10	20	30	10	20	30
Maize offal	20	15	10	23	21	19
WCS	10	20	30	-	-	-
CSC	-	-	-	10	20	30
BDG	26	21	16	23	15	7
Rice offal	40	40	40	40	40	40
Molasses	2	2	2	2	2	2
Bone meal	1.5	1.5	1.5	1.5	1.5	1.5
Common Salt	0.5	0.5	0.5	0.5	0.5	0.5
Total	**100**	**100**	**100**	**100**	**100**	**100**

WCS= Whole Cottonseed, CSC=Cottonseed cake, BDG= Brewers dried grain

Experimental Animals and Management

Twenty-four (24) Red Sokoto bucks of about 6-8 months of age were sourced from Zaria metropolis. They were dewormed using albendazole tablets (Centre-Alben®- Aether Centre Biology Co., Ltd. Beijing) at the rate of 5 mg/kg body weight, covered with TLA-Tetracycline long acting-TLA (oxytetracycline dehydrate) 20% weight/volume injectable solution administered at 0.1 mg/10 kg live weight against possible bacterial infection. Each buck was kept separately in individual crates. The animals were quarantined for a period of 3 weeks and further 2 weeks for adjustment period before commencement of the study.

Data Collection

Data collected in the course of the study was buck scrotal circumference and semen for evaluation of sperm characteristics and morphology

Semen Collection and Evaluation

Semen samples was collected from bucks using an electro-ejaculator every two weeks (fortnightly) between 9:00 am and 10:00 am during the study into calibrated test-tubes. The ejaculates were examined for volume, colour, concentration, gross motility, live and dead sperm, pH, and sperm morphological abnormalities

Statistical Analysis

All data generated were subjected to Factorial Analysis of Variance (ANOVA) using the General Linear Model (GLM) Procedure of Statistical Analysis System (SAS, 2008) and where statistical significance was observed, the mean values were separated using Tukey.

RESULTS AND DISCUSSION

Effect of Duration of Feeding on Scrotal circumference, Semen Quality and sperm morphology characteristics of red Bucks fed Whole cottonseed and Cottonseed cake

Table 2 shows the effect of feeding period on the scrotal circumference and semen quality of Red Sokoto bucks fed diets containing WCS or CSC. Number of detached head increased significantly from 2nd to 4th week and decreased by the 6th week until the 10th week when it increased again and dropped by the 12th week. Number of sperm cells with coiled tail were significantly ($P<0.05$) different but followed similar pattern as the detached head. There was significant ($P<0.01$) reduction in percentage of free tail spermatozoa observed per ejaculate from week 2 to 12, while the number of cytoplasmic droplets increased significantly ($P<0.001$) during the study period. From week 2 to 4, dag defects declined significantly after which more dag defects were observed in the subsequent ejaculates. There was a slight increase in spermatozoa with stunted tail from week 2 to 4 after which there was a significant

(P<0.02) decrease at week 6 and increase at week 8 followed by decline till the end of the study. The presence of abnormal forms of spermatozoa recorded were consistent with the reports of Moss *et al* (1979) that a number of abnormal forms are normally encountered in all ejaculates. Semen from red sokoto bucks contain some abnormal form of spermatozoa which is not associated with low fertility rate until the proportion of abnormalities exceeds 20% even then certain types of abnormalities may not be associated with infertility (Singh *et al*., 2012).

Table 2: Effect of Duration of feeding on scrotal circumference, semen characteristics and sperm morphology of Red Sokoto bucks fed Whole cottonseed and Cottonseed cake

	Duration of feeding (weeks)								
Characteristics	2	4	6	8	10	12	SEM	P-value	LOS
Scrotal cir. (cm)	15.89	15.10	15.89	15.09	15.44	15.41	0.68	0.92	NS
Semen colour	2.17	2.06	2.00	1.94	2.11	2.17	0.18	0.94	NS
Volume (mL)	0.20	0.20	0.16	0.32	0.21	0.19	0.05	0.37	NS
Motility (%)	76.39	74.44	65.83	71.94	73.33	77.22	5.73	0.77	NS
Sperm Conc ($\times 10^6$)	227.50	262.11	231.06	226.33	273.83	284.67	33.50	0.199	NS
pH	7.11	7.11	7.22	7.277	7.22	7.22	0.12	0.91	NS
Live ratio (%)	78.61	67.50	76.67	74.17	76.11	67.22	4,01	0.21	NS
Sperm Morphology (%)									
Normal Cells	60.28^{c}	62.22^{bc}	65.28^{abc}	67.67^{ab}	67.72^{ab}	70.44^{a}	2.82	0.12	*
Detached Head	15.00^{b}	18.83^{a}	12.50^{c}	9.44^{d}	11.94^{c}	11.17^{cd}	1.24	0.0001	***
Coiled Tail	7.78^{a}	4.11^{d}	6.39^{abc}	6.72^{ab}	5.50^{bcd}	5.06^{cd}	0.79	0.02	*

Means within rows with different superscripts are significantly different (*= P<0.05)SEM: Standard error of means; LOS: Level of significance Semen colour: 1-Watery; 2-Milky; 3-Creamy, cir. Circumference

CONCLUSION

There was generally decline in sperm motility, concentration and live spermatozoa with increase in whole cottonseed but increased with increase in cottonseed cake. Semen characteristics such as sperm motility and concentration, percent live spermatozoa were better in bucks fed CSC and those that received lower inclusion levels (10 and 20%) of the cotton products.

RECOMMENDATION

Pubertal bucks kept for breeding purposes can be fed up to 10% inclusion of whole cottonseed and up to 20% inclusion of cottonseed cake in their diets and for up to 4 months

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