



NUTRITIONAL EFFECTS OF GROUNDNUT HAULMS ON TESTICULAR FUNCTIONS AND ONSET OF PUBERTY OF KANO BROWN BUCK KIDS

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ABSTRACT

This study was carried out to investigate the effects of feeding groundnut haulms on onset of puberty and testicular functions of Kano Brown buck (KBB) kids. A total of 30 KBB, aged 3 months old with average initial body weight of 6.05 ± 1.57 kg were used for the study. Animals were kept in an individual pens under one shed to eliminate any variations attributed to environmental and management changes. A concentrate diet (control) was formulated to contain 13% crude protein and groundnut haulms were supplemented at 0, 100, 200, 300 and 400 g/head/day designated as T₁, T₂, T₃, T₄ and T₅, respectively. Animals on treatment 1 were fed on the control diet (*ad libitum*) for the whole period of the experiment. Animals on treatments 2, 3, 4 and 5 were also offered the control diet and supplemented with 100, 200, 300 and 400 g/head/day of sun-dried groundnut haulms, respectively. Result showed that age at puberty decreased significantly ($P < 0.05$) with increased groundnut haulms supplementation, with animals on T₅ (400 g) attained puberty earlier followed by those on T₄ (300 g) supplementation. Animals on the control (0 g) attained puberty at a later age. Semen volume, semen colour, normal sperm cells, concentration, motility and scrotal circumference were significantly ($P < 0.05$) higher in animals on T₅ (400 g) supplementation at the onset of puberty. Sperm morphological abnormalities (detached head, narrow head, coil tail and bent tail) decreased significantly ($P < 0.05$) with increased groundnut haulms supplementation. It is concluded that feeding groundnut haulms hastened attainment of age at onset of puberty with significant increased in testicular functions of KBB.

Key words: Nutrition, onset of puberty, groundnut haulms, testicular functions, Kano Brown buck kids.

Introduction

Goats are kept primarily for meat and contribute substantially to the household income and food security in most rural areas (Raji *et al.*, 2008). The reproductive efficiency in goat production is aimed at bringing both young male and female animals into optimum sperm cell production and conception at an early age. The interaction between nutrition and reproduction has been known to have important implications for the reproductive performance of farm animals (Bindari *et al.*, 2013). Nutrition is central to reproductive performance with sub-optimal nutrition associated with delayed onset of puberty, reduced expression of reproductive behaviours, reduced reproductive rates and poor growth of young. However, reproductive behaviour is inhibited as nutrition becomes progressively more limiting and also, optimal levels of nutrition are required if animals are to express their full genetic potential for reproduction. Puberty in bovine bulls has been defined as the age at which ejaculated semen contained at least 50×10^6 spermatozoa with a minimum of 10% motility (Oyedipe *et al.*, 1981; Rekwot *et al.*, 1987). It is also defined as the age at which sexual development is attained and the animals become capable of reproduction (first ovulation in the female and first spermatozoa in the ejaculate of the male) (Bielli *et al.*, 2001). Early puberty is an important index to achieve optimum reproductive performance in goats. Puberty can also be achieved at an earlier age with improved feeding and, thus, reduction in the generation interval and then increase the rate of genetic gain of our local livestock. Animals that are gaining more rapid weight due to increased feed intake have greater weight of internal organs as a proportion of body weight, higher rate of metabolism, higher circulating concentration of insulin-like growth factor-I (IGF-I), and they attain puberty earlier (Wester,



1994). The age at which puberty is attained is more dependent upon body weight than influenced by animal's plane of nutrition. Puberty is achieved when sexual maturation has progressed to the point where insemination and fertilization can be accomplished. Effective male reproduction requires both the production of sufficient and viable spermatozoa and adequate libido to ensure deposition of the sperm cells in the female genital tract. Full development of the sex organs is required to physically accomplish a successful mating and development, if libido is needed to initiate copulation. Failure to achieve maturity in any aspect will result in reproductive incapability (Wester, 1994). The current study was designed to investigate the nutritional effects of groundnut haulms on onset of puberty and testicular functions of KBB.

Materials and methods

Study Area

The study was conducted at the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture and Agricultural Technology, Kano University of Science and Technology, Wudil. Wudil lies between longitude 8°58' East and latitude 11° 35' North at an altitude of 403m above sea level. The average annual rainfall ranges from 850 to 870mm, minimum and maximum temperature is 26°C and 33°C, respectively (Olofin et al., 2008).

Experimental Animals

Thirty (30), three months (3) old male Kano Brown bucks with average body weight of 6.05 ± 1.572 kg were used for the study. Animals were treated against ecto-and-endo parasites using Ivotek super® (Ivermectin + Clorsulon) at dose of 200 µg/kg body weight. They were also vaccinated against pnuemo-enteritis complex [peste-des-petits ruminants (PPR)] at a dose of 1 ml/animal subcutaneously. Animals were quarantine for two (2) weeks and water and mineral lick were provided *ad libitum*. All animals were kept in individual pens under one shed so as to eliminate any variations attributed to environmental and management changes Mukherjee, 1992).

Experimental procedure

The thirty (30) animals were randomly divided into five (5) treatments of six (6) animals per treatment. Each animal within a group was housed individually. Animals in treatment 1 were fed on the basal diet (*ad libitum*) for the whole period of the experiment. Animals in treatments 2, 3, 4 and 5 were offered 100, 200, 300 and 400 g/head/day of sun-dried groundnut haulms supplement. A completely randomized design was used and data was taken for 24 weeks.

Pubertal study

Age at onset of puberty was determined as the age at which sexual development is attained and the animals become capable of reproduction (first spermatozoa in the ejaculate of the male) (Bielli *et al.*, 2001).

Semen collection and evaluation

Semen was collected and evaluated biweekly using Lane pulsator electro-ejaculator (Lane Manufacturing Co., Denver, Colorado). The following parameters were determined:- volume, motility, semen pH, colour, sperm concentration, live and dead ratio and sperm morphological abnormalities.

Statistical analysis

Data generated were coded and then subjected to analysis of variance (ANOVA) using General Linear Model of (SAS, 2002), where significant difference exist, means were separated using Duncans Multiple Range Test (DMRT).

Results and discussion



The results of the effect of groundnut haulms supplementation on pubertal characteristics is presented in Table 1. Although there was no significant ($P > 0.05$) difference in body weight for age at onset of puberty, animals on 400 g supplementation had numerically higher body weight. This confirmed earlier by report [4] that bulls on high protein diet have higher growth rate, compared to low-protein diet. Age at onset of puberty was significantly ($P < 0.05$) influenced by groundnut haulms supplementation. Animals on treatment 5 (400 g) supplementation attained puberty at earlier age than the other groups. This result may be attributed to higher protein consumed by these animals. This report was in agreement with the finding of Alabi, (2005) who showed that Bunaji bulls on low energy diets attained puberty later than those on high energy diets, apparently attributed to low nutrient intake. Similarly, Rekwot *et al.* (1987) reported that low concentration of protein in the diet of Bunaji bulls and their Friesian crosses delays onset of puberty and that Bunaji bulls attain puberty later than their Friesian crosses, when placed on low protein diets, but earlier when placed on high protein diet. Additionally, Reid and Looli (1964) reported that feeding 100% total digestible nutrient levels to heifers enable them to attain puberty at 49 weeks, compared to 88 weeks when the level is reduced to 68% total digestible nutrients.

Scrotal circumference, semen volume, semen colour, normal sperm cells, concentration and motility (Table 1) increased significantly ($P < 0.05$) with increase groundnut haulms supplementation at onset of puberty. This result confirmed the report of Hassa (2010) that yearling Kano Brown bucks fed graded levels of groundnut haulms have significantly ($P < 0.05$) higher scrotal circumference, semen volume, colour, motility, concentration and normal spermatozoa. Rekwot *et al.* (1987) also reported similar observation in Bunaji bulls and their Friesian crosses on low and high protein diets, where bulls on high protein diets attained puberty at a younger age with better pubertal traits than those placed on low protein diets. A significant ($P < 0.05$) high percentage of sperm morphological abnormalities (Table 2) for animals on lower groundnut haulms (100 g) and the controls (0 g) in the present study showed that animals on higher levels of supplementation (300 g and 400 g) had better semen traits and attained puberty at an earlier age. This agreed with the report of Rekwot *et al.* (1988) that bulls fed low protein diets have poorer semen quality than those fed high protein diets.

Conclusions

The following conclusions could be drawn from the present study:-

- Groundnut haulms enhanced attainment of onset of puberty in KBB kids, indicating that supplementation up to 400 g reduce age at puberty and improved reproduction in buck kids.
- Testicular functions were significantly improved with increased groundnut haulms supplementation
- Sperm morphological abnormalities were reduced with increased groundnut haulms supplementation.

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Table 1: Pubertal characteristic of Kano Brown bucks fed groundnut haulms supplements at onset of puberty

Parameter	Treatments (g)					SEM
	0	100	200	300	400	
Body weight (kg)	6.78	7.17	7.57	7.77	7.92	0.58
Scrotal circumference (cm)	8.92 ^b	15.00 ^a	15.58 ^a	13.43 ^a	15.30 ^a	1.06
Semen volume (ml)	0.13 ^b	0.15 ^b	0.14 ^b	0.23 ^{ab}	0.42 ^a	0.07
Semen colour	2.17 ^b	2.17 ^b	2.67 ^{ab}	3.00 ^a	3.17 ^a	0.20
Semen Ph	8.00 ^a	7.83 ^a	7.83 ^a	7.5 ^a	6.67 ^b	0.21
Live spermatozoa (%)	26.17 ^c	51.67 ^{ab}	31.67 ^c	66.00 ^a	40.00 ^{bc}	6.05
Normal sperm cells (%)	23.45 ^b	50.58 ^a	50.29 ^a	50.46 ^a	53.12 ^a	4.37
Sperm concentration (x10 ⁶ /ml)	240.00 ^c	436.50 ^{bc}	525.00 ^{abc}	798.00 ^a	716.80 ^{ab}	101.09
Motility (%)	37.50 ^b	37.33 ^b	48.14 ^{ab}	63.09 ^a	45.33 ^{ab}	5.79
Age at puberty (months)	5.70 ^e	5.50 ^d	5.23 ^c	5.05 ^b	5.00 ^a	0.00

^{abcde}Means within the same row with different superscript are significantly different (p < 0.05) SEM = Standard Error of the Mean, n = 6 animals per group.

Table 2: Nutritional effects of groundnut haulms on sperm morphological abnormalities of KBB

Parameter	Treatments (g)					SEM
	0	100	200	300	400	
Detached head (%)	4.14 ^b	24.88 ^a	13.25 ^{ab}	7.67 ^b	10.74 ^{ab}	5.07
Narrow head (%)	42.58 ^a	15.06 ^b	10.91 ^b	20.48 ^b	16.20 ^b	3.32
Coil tail (%)	10.17 ^a	8.77 ^{ab}	7.69 ^{ab}	4.54 ^b	3.58 ^b	1.74
Bent tail (%)	19.67	14.27	16.09	16.54	15.83	1.86

^{ab}Means within the same row with different superscript are significantly different (p < 0.05) SEM = Standard Error of the Mean, n = 6 animals per group.