

## **Pubertal traits of male goats kept on rations supplemented with different protein types**

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**Abstract:** This study was carried out to determine the impact of type of protein supplementation to the ration on pubertal characteristics of male goat kids. Eighteen crossbred (Nubian × Saanen) weaned male goat kids were distributed to 3 ration groups. Group I (n=6) was kept on a ration supplemented with ground nut cakes, group II (n=6) on a ration supplemented with sesame cakes and group III (n=6) on a ration supplemented with cotton seed cakes. The pubertal traits studied were preputial separation, scrotal circumference at puberty, weight and age at puberty, ejaculate volume, individual motility percent and mass motility of semen, percentages of live and abnormal morphology spermatozoa and the concentration of spermatozoa. The results of this study revealed that only the pubertal body and the percentage of abnormal sperms were significantly influenced ( $p < 0.05$ ) with protein type. The least pubertal body weights and the high percentages of abnormal sperms were recorded in male goats kept on a ration supplemented with cotton seed cakes. Although the scrotal circumference was the least in the group fed on cotton seed cake based ration, it was not significantly ( $p > 0.05$ ) different from that of the other groups. It is concluded that the pubertal traits of male goat kids kept on rations supplemented with groundnut, sesame, or cotton seed cakes are nearly similar. However, cotton seed cakes supplementation to the ration of growing male goat kids reduces the pubertal body weight and increases the percentage of abnormal sperms.

**Keywords:** crossbred; goats; male; puberty; protein type

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### **I. Introduction**

The balanced nutrition has profound effects on the evolution of the reproductive and puberty traits in all animal species [1]. Contrarily, severe malnutrition has been proved to delay puberty and sexual maturity [2; 2]. In case of normal and balanced nutrition puberty takes place when the body weight of an animal reaches approximately 50-60% of the body weight of a mature animal of the species. Adding concentrates with adequate protein level to the ration of animals in cold areas, have been found to accelerate puberty [4]. Attainment of puberty is closely linked to the level of nutrition and body weight [5; 6]. On the other hand Elabid [7] stated that the addition of concentrates to the ration of Nubian goats has no effect on the age and weight at puberty. The level of nutrition has direct effect on sexual activity in sheep and goats and faulty nutrition negatively affects the males of many animal species [8]. The male fertility is not affected by the level of protein; however, high protein level in the ration is known to increase the sperm cell concentration and reduces the semen volume and sperm motility [9; 10]. Also Coulter and Kozubi [11] found that the quality of semen in animals fed a high-energy diet is lower than those fed on a moderate energy diet, especially the forward motility and sperm head abnormalities. In the Sudan abundant quantities of sesame, ground nut and cotton are available, consequently their byproducts can be used as feed additive. Although, the percentage of protein in sesame and ground nut and cotton cakes are enough to meet the growth requirement in farm animals [12; 13], their influences on puberty traits were not investigated. Considering the sparse researches that compares the influences of protein source on male goats pubertal characteristic; the current study is designed to evaluate the effects of adding sesame, ground nut and cotton cakes to the ration on the pubertal traits of crossbred male goats. The pubertal traits investigated were the preputial separation, scrotal circumference, pubertal weight, puberty age, volume of the first ejaculate, individual motility percent of sperms, mass motility of semen, percentages of live and abnormal morphology spermatozoa and the concentration of spermatozoa.

### **II. Materials And Methods**

#### **1. Study area and Animals**

This study was carried out at Hamdan's goat farm in Shambat, Khartoum North, Sudan (Latitude 15° 36' N, Longitude 32° 32' E). A total of 18 newly born singletons crossbred male goats (Pure Nubian × Pure Saanen) were used in this study. The kids were born in winter (January 2006).

## 2. Husbandry and management

The kids were reared with their dams until they were weaned at the age of 12 weeks. Their mean body weight at weaning was  $13.31 \pm 0.78$  kg. They were then grouped into three treatments groups: group I (n=6) was fed on a ration made at the farm at a rate of 200 gm per day (100gm in the morning and 100 gm in the evenings). This ration is formulated of 19 % groundnut cakes, 45% sorghum (*Sorghum vulgare*, vr. Fetarita), 31% molasses, 3% mineral mixture and 2% sodium chloride. Group II (n=6) were fed the same ration but with 19% sesame cake instead of the groundnut cakes. Group III (n= 6) were fed the same ration but with 19% cotton cakes instead of the groundnut cakes. The experimental animals were offered water and Alfa alfa ad libitum. They were then injected i.m. with 1ml/50 kg, Ivermectien (Ivomec ®, Merial, France) to control ectoparasites.

## 3. Measuring puberty characteristics:

The kids were weekly weighed and examined for preputial separation [14; 15; 16]. The scrotal circumferences were measured at puberty with a measuring tape [15; 16]. Semen collection trials started immediately after preputial separation using artificial vagina [15; 16]. The semen volume was recorded and the semen was kept in a water bath at 37° C. The mass motilities and the individual motility percentages were recorded [17]. The percent of live and abnormal sperms were determined with standard method [18]. The sperm cell concentration was determined by counting sperms with a hemocytometer[18; 19]. Onset of puberty was defined as the age when an ejaculate containing motile spermatozoa is collected.

## 4. Experimental design

This experiment is a one factorial design to determine the effect of protein source added to the feed on the characteristics of puberty. The protein sources that were used in this experiment were groundnut, cotton, sesame cakes. Eighteen kids (12weeks old) whose mean body weight was  $13.31 \pm 0.78$  kg were distributed to the three groups. The three groups were fed as described above. The pubertal traits investigated were preputial separation, scrotal circumference, weight, puberty age, volume of the first ejaculate, individual motility percent and mass motility of semen, percentages of live and abnormal morphology spermatozoa and the concentration of spermatozoa. Pubertal traits were assed as described above. Onset of puberty was defined as the age when an ejaculate containing motile spermatozoa is collected.

## 5. Statistical analysis

Data are subjected to ANOVA. Data are presented as means  $\pm$  standard error of the mean (SE). Probabilities of  $p < 0.05$  were considered significant.

## III. Results

As shown in Table (1), the source of protein significantly ( $P < 0.05$ ) influenced the puberty body weight of the kids. The average weights at puberty for kids kept on a ration supplemented with groundnut cakes, sesame cakes or cotton seed cakes are  $23.4 \pm 1.7$ ,  $20.3 \pm 9$ ,  $18.2 \pm 1.1$  kg, respectively. The mean body weight was high in the group fed on a ration supplemented with the groundnut cake followed by those fed on a ration supplemented with sesame cake while the least mean body weight was recorded in those kids kept on a ration supplemented with cottonseed cake. The highest weight at puberty recorded for the groundnut cake group was 29.400 kg, sesame cake group was 24,200 kg and cottonseed cake group was 20.800 kg, while the least weights were 18.200 kg, 18.200 kg and 14 kg, respectively. The other reproductive traits (table 1) were not influenced ( $p > 0.05$ ) with the source of protein. However, the testicular size (scrotal circumference) is smaller in the group fed on a ration supplemented with the cotton cakes. No significant differences ( $p > 0.05$ ) were observed in the pubertal semen characteristics except the abnormal sperm percent which was significantly high ( $p < 0.05$ ) in male goat kids fed on ration supplemented with sesame or cotton cakes (Table 2).

Table 1. Influence of protein source supplemented to the ration on male goat pubertal traits

Parameters	Protein source		
	Groundnut cake	Sesame cake	Cotton cake
Preputial separation (days)	$16.7 \pm 0.4$	$16.8 \pm 0.3$	$17.5 \pm 0.3$
Pubertal weight (kg)	$23.4 \pm 1.7^a$	$20.3 \pm 0.9^{a,b}$	$18.2 \pm 1.1^b$
Pubertal age (weeks)	$30.3 \pm 0.3$	$27.5 \pm 0.2$	$28.7 \pm 1.3$
Scrotal circumference (cm)	$22.2 \pm 0.8$	$21.5 \pm 1.4$	$18.8 \pm 1.1$

Data are means  $\pm$  SE of six replicates. Values with different superscripts in the same raw differ ( $^{a,b} p < 0.05$ ).

Table 2. Influence of protein source supplemented to the ration on semen characteristics of pubertal male goats

Parameters	Protein source		
	Groundnut cake	Sesame cake	Cotton cake
Ejaculate volume (ml)	0.65 ± 0.3	0.63 ± 0.8	0.68 ± 0.1
Mass motility	3.67 ± 0.2	3.83 ± 0.2	3.67 ± 0.2
Individual motility (%)	82.5 ± 3.4	79.2 ± 2.1	77.5 ± 2.5
Live sperm (%)	90.0 ± 1.9	87.2 ± 1.1	87.2 ± 2.1
Sperm cell concentration	2.2 ± 0.6 × 10 <sup>9</sup>	1.9 ± 0.3 × 10 <sup>9</sup>	2.4 ± 0.5 × 10 <sup>9</sup>
Abnormality (%)	3.8 ± 0.7 <sup>a</sup>	6.7 ± 0.8 <sup>b</sup>	7.3 ± 1.1 <sup>b</sup>

Data are means ± SE of six replicates. Values with different superscripts in the same raw differ (<sup>a, b</sup> p < 0.05).

#### IV. Discussion

This study demonstrated that cross-bred male goat kids fed on a ration supplemented with groundnut cakes have pubertal body weights superior to those fed on ration supplement with cotton or sesame cakes. Many studies have shown that the protein found in cotton, groundnut or sesame cakes meets the growth requirements that precede puberty [12; 13; 20]. However the results of this study proved that feeding prepubertal male goat kids on a ration supplemented with cotton seed cakes, reduces their pubertal body weight and the scrotal circumference. This difference is attributed to the difference in the level of protein where cotton seed cake has a lower protein level compared to that of ground nut and sesame [21]. Also the effect of the toxic gossypol of cotton seeds, which were not exposed to high temperatures during oils manufacturing, cannot be ignored. In this study, pubertal weights of male goat kids fed on a ration containing sesame cakes are similar to those fed on a ration containing groundnut cakes and this is due to the similarity in the level of protein [21]. The age of puberty of all kids was similar and not affected by the source of protein added to the ration. This is normal because puberty is attained at a certain age and is highly influenced by the season and breed and the extreme nutritional deficiency is known to affect the age of puberty (2; 3; 7; 22].

The study pointed no significant variations in most of the semen characteristics between all the food groups and all semen properties were good; except the increments in the percentages of abnormal and dead sperms recorded in the group of kids fed on ration supplemented with cotton seed cake. It is well known that male fertility is not affected much by rations and ration that contains only 12% of the protein or less is sufficient to get a good quality semen, but a severe shortage in the proportion of protein may result in production of poor quality semen [9; 10; 11] The increment of the percentages of abnormal and dead sperms recorded in the group fed on a ration supplemented with cotton seed cakes can be attributed to the presence of gossypol which was not well exposed to high heat during oil manufacturing.

#### V. Conclusion

It is concluded that the pubertal traits of male goat kids kept on rations supplemented with groundnut cakes, sesame cakes or cotton seed cakes are nearly similar. However, cotton seed cakes supplementation to the ration of male goat kids reduces the pubertal body weight and increases the percentage of abnormal sperms.

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