SEMEN CHARACTERISTICS AND SCROTAL BIOMETRY OF WEST AFRICAN DWARF RAMS FED AMMONIUM SULPHATE FORTIFIED DIET

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ABSTRACT

Ammonium sulphate (AS) is non-protein nitrogen sources widely used as a feed additive for ruminants to provide sulphur (S) to the diet. This study assessed the semen characteristics and scrotal biometry of West African dwarf rams fed AS fortified diets at 0, 2.5, 5.0 and 7.5g/kg to the concentrate diet as T1, T2, T3 and T4 respectively. Sixteen WAD rams with average body weight of 12.20±0.12 kg were used and fed for 105 days. Each treatment had four replicates while semen was collected once from all replicates in the treatments. There was significant difference in the sperm concentration ($x10^9$/mL) with T4 (160.06) having the highest while T1 (136.00) had the lowest. The total sperm ejaculate followed the same trend as sperm concentration with the lowest value recorded for rams fed T1 (98.24) while those on T4 (150.66) had the highest value. There were significant differences in the values recorded for the scrotal circumference and length, however, scrotal width, testicular weight, scrotal length and scrotal circumference values in T4 was numerically higher than other treatments. It can be concluded that AS fortified diets at 7.5g/kg improved the semen quality positively.

Keywords: Ammonium sulphate, scrotal weight, sperm-livability, testicular weight.

INTRODUCTION

In Nigeria, a major limitation to animal production is poor reproductive performance (RIMS, 1992). Enjalbert (2006) attributed many reproductive health disorders in animals to diet inadequacy. The most important thing to be conscious of regarding sulphate-containing compound is optimum levels in the diet as low ruminal sulfur concentration can also depress microbial growth (Bal and Ozturk, 2006). Testicular traits are important variables closely associated with sperm features and animal fertility. The shape and content of the scrotum are associated with fertility parameters (Coulter and Foote, 1977). Scrotal circumference and testicular consistency have been widely used in predicting the reproductive capacity of male domestic animals. However, seminal attributes are affected by many factors, including the breed, body weight, age, management, climatic conditions, nutrition, method of semen collection and degree of sexual stimulation (Zamiri and Heidari, 2006). The dearth of information on the effect of ammonium sulphate fortified diets on semen characteristics and scrotal biometry of WAD rams hence, the need for this study.

MATERIALS AND METHOD

The study was conducted in the Sheep Unit of the Teaching and Research Farm, University of Ibadan, Nigeria. Brewers dry grain (23kg), palm kernel cake (10kg), dicalcium phosphate (1kg), oyster shell (2kg), salt (2kg), growers premix (1kg), urea (1kg) and dry cassava peel (60kg) were mixed and 0, 2.5, 5.0 and 7.5g/kg levels of ammonium sulphate were added on top of the feed ingredients for T1, T2, T3 and T4 respectively. Semen samples were collected using electro-ejaculator as described by (Jibril *et al.*, 2011) from rams in each group and evaluated. Data generated from parameters investigated were subjected to Analysis of Variance (ANOVA) using Statistical Analysis System (SAS, 1999).

RESULTS AND DISCUSSION

The colour obtained in this study was in conformation with the semen characteristics of pubertal West Africa dwarf rams fed pineapple waste silage as replacement for dried cassava peel as reported by Ososanya *et al.* (2013). Colour of semen in this study was also similar to the report of Oyeyemi *et al* (2011).

The semen volume is one of the important factors in semen evaluation and reproductive performance in the males (Ax *et al.*, 2000). The results of the present study showed that semen volume was not significant in the treatment groups. However, rams on T2, T3 and T4 had higher values than those in T1 but contrary to the

report of Kheradmand *et al.* (2006) that there was a tendency for semen volume to increase in the treatment groups, in comparison with the control group. The ejaculate volume was not in conformation with report at the onset of puberty in Boer goats (Noran *et al.*, 1998). However, the values obtained in this study are close to values of Summermatter and Flukiger (1985) who reported a range of 0.2-1.2ml for the ejaculate volume of bucks. Furthermore, the value obtained in this study fell in the range of the sperm volume (0.62-0.92ml) obtained by Nwafaq *et al.* (2013) on semen characteristics of Meriz bucks in response to different doses of prostaglandin F_2.

The mass activity of rams on T2 to T4 which were fed with ammonium sulphate fortified diets exerted significance with rams fed T1 which were not fed ammonium sulphate fortified diets but this was in agreement with the result obtained by Ososanya *et al.* (2013).

The sperm motility of rams fed T2 to T4 obtained in the present study showed higher values with significance ($P<0.05$) compared to the report on 13 month old Murciano-Granadina male goats in all four seasons of the year (Roca *et al.*, 1992). These differences might be due to breed, age and environmental factors. However, sperm motility is an indicator of semen fertilizing ability (Blottner *et al.*, 2001).

The livability of semen in rams on T2 to T3 fed ammonium sulphate fortified diets showed significant effect from T4. The livability of T1 which had no ammonium sulphate inclusion in their diet had the lowest value. The report on pubertal and adult bucks (Bitto and Egbunike, 2012) was higher than values of livability obtained for this study; these differences may result due to species, nutritional status, environmental differences and the differences in the methods used for semen collection.

No significant differences existed in morphology between rams on T2 and T3 that were fed ammonium sulphate fortified diets. The report of this study were lower than the report which states that the percentage of morphological abnormalities in the semen was below average and poorly fertile bucks may be 10-15%, and above 15 respectively (Ott, 1978).

The sperm concentration of rams on T4 was highly significant among other treatment fed with ammonium sulphate. Obtained result in the present study were respectively lower than the corresponding values reported by Noran *et al.* (1998) for adult Katjang and Katjang x German Fawn goats. This variation may be a result of species difference in seminal characteristics. Although, the value obtained in this study fell within the range of the sperm concentration (150-204) obtained by Nwafaq *et al.* (2013) on semen characteristics of meriz bucks in response to different doses of prostaglandin PGF_2.

The total sperm/ejaculation values observed in this study were in the range of the total sperm /ejaculate (92- 194) obtained by Nwafaq *et al.* (2013) on semen characteristics of Meriz bucks in response to different doses of prostaglandin F_2.

The total sperm of rams fed ammonium sulphate fortified diets showed significant difference ($P<0.05$).

There was significant ($P<0.05$) difference in scrotal biometry of rams fed ammonium sulphate fortified diets. The scrotal circumference ranged from 23.71cm (T1) to 25.50cm (T4). The scrotal length, scrotal width and scrotal weight were lowest in T1 with values of 6.80cm, 6.63cm and 48.63cm respectively while T4 was highest with values of 14.25cm, 7.00cm and 56.61cm for scrotal length, scrotal width and scrotal weight respectively. There were significant ($P>0.05$) differences in the scrotal circumference, length, width and weight across the treatments. The values for scrotal circumference ranged between 23.71 - 25.50cm contrary to the range of 15.98-19.43cm reported by Naoman and Taha (2010) for changes in testicular circumference following hemi-castration in adult Iraqi bucks. Scrotal circumference is an important reproductive signal for breeding soundness in animals. The obtained result in this study was higher than those reported by Ososanya *et al.* (2013) that the scrotal ranged in diameter between 16.00cm to 21.40cm and scrotal length from 8.83cm and 12.75cm. This present report was also in agreement with Fernandez *et al.* (2004) who observed that testicular growth can be affected when animals were fed beyond their maintenance level. In addition, the scrotal circumference is related to testicular weight, sperm production, and semen quality, age at puberty, body weight and age in young bulls (Swanepoel and Heyns, 1990). Therefore, animals with small testicles have reduced sperm production and poor semen quality. Lindsay *et*

al. (1984) also found no significant effect of improved pasture or high dietary protein on testicular dimensions. In addition, this study correlated with the report that the semen of most males contains a small amount of morphologically abnormal sperm (Hafez, 2004).

CONCLUSION

Ammonium sulphate fortified diet at 7.5g/kg had no deleterious effect on semen characteristics. The semen volume, mass activity, motility, livability, sperm concentration, total sperm ejaculate and scrotal circumference were highest in T4 at 7.5g/kg ammonium sulphate fortification, indicating that T4 performed best in semen characteristics.

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Table 1: Semen characteristics and scrotal biometry of West African dwarf rams fed ammonium sulphate fortified diets.

PARAMETERS	T1	T2	T3	T4	SEM
Colour	Creamy	Creamy	Creamy	Creamy	
Volume (mL)	0.73^{d}	0.83^{b}	0.83^{b}	0.96^{a}	0.01
Mass Activity (1-5)	3.00^{b}	3.00^{b}	3.00^{b}	3.33^{a}	0.01
Motility (%)	84.71^{d}	89.05^{c}	92.25^{b}	97.05^{a}	0.04
Livability (%)	85.05^{c}	88.26^{b}	88.29^{b}	90.71^{a}	0.07
Morphology (%)	0.91^{c}	1.60^{b}	1.68^{b}	2.33^{a}	0.03
Sperm Conc. ($x10^{9}$/mL)	136.00^{d}	139.25^{b}	152.75^{b}	160.25^{a}	0.76
Total Sperm Ejaculate	98.24^{d}	114.35^{c}	124.41^{b}	150.66^{a}	0.82
S. Circumference	23.71^{b}	23.29^{b}	24.19^{ab}	25.50^{a}	0.53
S. Length	6.80^{b}	13.31^{a}	13.71^{a}	14.25^{a}	0.32
S. Width	6.63^{c}	6.80^{b}	6.80^{b}	7.00^{a}	0.05
T. Weight	48.63^{d}	52.63^{c}	53.16^{b}	56.61^{a}	0.04

a, b, c, d: means in the same row with different superscripts are significantly($P<0.05$) different.
SEM: Standard Error of Mean, S. Circumference: Scrotal circumference, S. Length: Scrotal length, S. Width: Scrotal width, T. Weight: Testicular weight