EFFECTS OF PLANE OF NUTRITION AND REARING METHOD ON YANKASA LAMBS: GROWTH RATE, SCROTAL DEVELOPMENT AND PUBERTY

G.N. AKPA, O.A. OSINOWO*, N.I. DIM AND E.O. OYEDIPE*

Animal Science Department, Ahmadu Bello University, Zaria, Nigeria.

**National Animal Production Research Institute, Ahmadu Bello University, Shika, Zaria. Nigeria.*

Received 6 May 1994; Accepted 5 November 1994

ABSTRACT

The study examined the effects of plane of nutrition and rearing method on growth rate, increase in scrotal size; and age, body weight and scrotal circumference at puberty, in Yankasa ram lambs. Thirty-six ram lambs and 18 ewe lambs with mean age and body weight of 1453±17.7 days and 10.1 1±2.6kg respectively were used for the four-month trial. Animals were randomised in a 3x2 factorial design with plane of nutrition at 3 levels (low, medium and high) and rearing method at 2 levels (males alone and mixture of males and females). Plane of nutrition had highly significant ($P<0.01$) effect on average daily gain (ADG). Animals on the low, medium and high planes gained daily 66.8±5.5, 77.8±5.6 and 89.0±5.6 respectively. Effects of plane of nutrition and rearing methods on changes in scrotal circumference were not significant. Age, body weight and scrotal circumference at puberty in the ram lambs averaged 232.5±12.7 days, 18.3±0.4 kg and 22.7±3.1 cm respectively. Body weight at puberty averaged 17.2±1.7, 18.6±0.9 and 19.0±1.4 kg for animals fed low, medium and high planes of nutrition respectively.

Key Words: Yankasa lambs, Management, Growth rate, Puberty.

INTRODUCTION

Increasing productivity is one of the primary goals in sheep production and growth is also of major concern to livestock farmers. Studies have been carried out on growth and sexual development in sheep (Hafez, 1952; Allen and Lamming, 1961; Southam *et al.,* 1971) which show that heredity, enviroment and plane of nutrition are major factors that could determine growth and development. Reports (see review by Dyrmondsson, 1973) on the age and body weight at puberty in rams of various breeds of sheep under different environmental conditions exist. Nutrition has a great influence on the reproductive performance of sheep (Southam *et al.,* 1971; Orji and Steinbach, 1980; Osinowo and Adu, 1985). Severe undernutrition can delay growth and development and consequently, delay the onset, age and weight at puberty in sheep.

The present study was carried out to test the effects of plane of nutrition and rearing method on growth, scrotal circumference, age and body weight at puberty in Yankasa ram lambs.

MATERIALS AND METHODS

Fifty-four lambs made up of 36 males and 18 females were used for the study. The mean (± SD) age and weight of animals at the beginning of the experiment were 145.3±17.70 days and 10.1±17.70 days and 10.1±0.50kg, respectively. There were two groups, namely males only and a mixture of males and females, in a randomised 3 x 2 factorial design. The animals in each group were assigned to 3 different planes of nutrition with 6 animals in each plane. Planes of nutrition ($DM/Kgw^{0.75}$) involving the mixed groups were replicated. The different planes were low ($40gDM/KgW^{0.75}$), medium ($50gDM/KgW^{0.75}$) and high ($60gDM/KgW^{0.75}$), for concentrate feeds, while Gamba hay *(Andropogon gayanus)* was given at 2% body weight as basal for all animals. Concentrate feed was given in the morning between 8.00 and 9.00h and hay in the afternoon 12.00 to 13.00h daily. Water was supplied *ad libitum.* The concentrate feed (16%CP) in percentage consisted of cottonseed cake 43.89, maize 54.86, bone meal 0.5, common salt 0.5 and vitamin/mineral premix 0.25. Body weight and

scrotal circumference were taken every 19 days from the start of the experiment through 4 months duration. Scrotal circumference measurements were taken at the widest diameter using a flexible tape. Weight gain during the experiment was obtained and divided by the number of days on the experiment to deduce average daily gain (ADG).

Puberty was defined as the age, body weight and scrotal circumference when at least one sperm cell was present in preputial swabs. Swabs wetted in normal saline with cover slips and viewed under a phase contrast microscope with magnification of x40 to check for presence of sperm cells. This was done on weekly basis (Mondays). Rams with smears containing sperm cells were excluded from subsequent examinations. Such animals were then weighed, scrotal circumference taken and their ages recorded.

Least squares analysis (Wilkinson, 1988) of variance was done for all parameters considered. Initial weight of the animals had great influence on growth rate during the experiment and was therefore treated as covariate in the analysis.

RESULTS

There average daily gain (ADG) of Yankasa ram lambs in this study was 79.3±5.87 g (Table 1). Plane of nutrition significantly ($P>0.05$) influenced ADG, indicating increase in liveweight gain with increasing plane of nutrition. Rearing effect was not significant ($P>0.05$) as rams in the males group gained 87.6±90g/day compared to rams in the mixed group (75.2±4.98g/day).

The least squares means for changes in scrotal circumference in Yankasa ram lambs are shown in Table 1. The mean change in scrotal circumference was 11.8±0.04cm. The effect of plane of nutrition and rearing method on age and scrotal circumference at puberty (Table 1) were not significant ($P>0.05$). However, there was a highly significant ($P<0.01$) effect of plane of nutrition on body weight at puberty, while rearing method was not significant ($P>0.05$). The average body weight at puberty was 18.3±0.44kg. For low, medium and high planes of nutrition, mean corresponding weights at puberty were 17.2±1.65, 18.6±0.85 and 19.0±1.39kg respectively. Males reared solely weighed 18.7±0.99 kg while males in mixed rearing weighed 17.8±1.06kg at puberty.

DISCUSSION

From the results of this study, it appears that plane of nutrition rather than rearing method was a more important factor in sheep rearing practice. The ADG increased with increasing plane of nutrition, showing that the genetic potential for growth rate can be fully exploited through adequate feeding. The ADG (79.3g/day) for rams in this study was higher than what was previously reported (66.8g/day; Osinowo *et al.*, 1991) for males of the same breed. This could partly be due to the effect of plane of nutrition imposed on the present study, which seemed to be of quality. The ADG of 79.3g/day for the Yankasa ram lambs is considered low. The higher non-significant gains made by males only (87.6g/day) than mixed rearing (75.2g/day) might indicate that there were some advantages in rearing males separately from the females within the age and body weight range used in this study. This could result in attaining the desired mature weight at considerably lower age and the consequent reduction in production cost.

Plane of nutrition and rearing method did not have significant effect on the scrotal circumference of Yankasa rams. It could be inferred that each of the 3 planes, low, medium and high, used in this study was good enough to support optional sexual development.

Plane of nutrition showed a highly significant effect on body weight at puberty. However, the non-significant effect of plane of nutrition on age at puberty supports the reports of Johnson *et al.* (1988) on age at puberty for Morada Nova ewe lambs fed varying dietary energy levels. Earlier reports (Allen and Lamming, 1961; Orji and Steinbach, 1980) suggest that lambs with rapid growth rate before puberty

usually attained puberty at a younger age but at a higher body weight than the slower growing lambs. The lower age at puberty observed in the mixed group supports the general view that animals reared in mixed sexes of males and females attain puberty at an early age (Nelson *et al.*, 1982). This could be as a result of constant stimulus due to the presence of females. In this study puberty was attained at 40.7 (25.8-54.9)% of mature body weight. With normal nutritional level, puberty occurs when body weight reaches 40-60% of the adult body weight in sheep (Terrill, 1974; Thibault and Levassour, 1974). The observation in the present study is meaningful and tends to suggest that with good nutrition and constant stimulus, puberty could be attained at a reasonable percent of adult body weight. The age at puberty in this study was lower than that reported for rams of the same breed, 232 days (33weeks) compared to 39 weeks (Osinowo *et al.*, 1991). This reduction could be due to the higher plane of nutrition.

CONCLUSION

The results of this study suggest that growth rate in Yankasa lambs is enhanced by sole rearing of lambs and that increasing the plane of nutrition under this practice could bring about optional growth at a lower age. It also had a highly significant ($P<0.01$) effect on body weight at puberty. The study had succeded in defining the scrotal circumference (22.7±3.10cm), age (232.5±13.66 days) and body weight (18.3±0.44kg) at puberty in Yankasa ram lambs.

ACKNOWLEDGEMENT

The authors are very grateful to the Director of the National Animal Production Research Institute (NAPRI) for providing facilities for this study. We also wish to thank the Programme Leader, Field and Technical Staff of the Small Ruminant Research Programme, NAPRI, for technical assistance; and Miss A.N. Nwaobasi for typing this paper.

REFERENCES

ALLEN, D.M. and LAMMING, G.E. (1961.) Some effects of nutrition on the growth and sexual development of the ewe lamb. J. Agric Sci., 57:87-95.

DYMUNDSSON, D.R., (1973.) Puberty and early reproductive performance in sheep. II. Ram lambs. Anim. Breed. Abstr. 41:419-430.

HAFEZ, E.S.E. (1952.) Studies on the breeding season and reproduction of the ewe. J. Agric Sci. 42: 189-265.

JOHNSON, W.L.; N.N. BARROS; E.R. de OLIVEIRA; A.A. SIMPLICIO AND G.S. RIERA, (1988.) Dietary energy levels and age and body weight at puberty in Morada Nova ewe lambs, in Northeast Brazil. Small Rum. Res. 1:67-72.

NELSSON, J.L. D.L. DAVIS; J.V. CRAIG and R.H. HINS., (1982.) Reproductive development in young boar exposed to sexually mature, non-pregnant sows and gilts. Theriol. 17 (5): 545-550.

ORJI, B.I. and J. STEINBACH, (1980.) Pubertal development in Nigerian Dwarf sheep. I. Age and body weight at puberty in ewe lambs. Nig. J. Anim. Prod., 7(1):63-70.

OSINOWO, O.A. and ADU, I.F., (1985.) Guide on intesive sheep production. Animal Production Series No. 2, NAPRI/ABU, Shika, Zaria.

OSINOWO. O.A.; MARIRE, B.N. and EKPE, G.A. (1991.) Yankasa rams: Postnatal growth and reproductive tract development. Anim. Reprod. Sci. (In press).

SOUTHAM, E.R.; HULLET, C.V. and BOTKIN, M.P., (1971.) Factors influencing reproduction in ewe lambs. Anim. Breed. Abstr., 40: 3284.

TERRIL, C.E., (1974.) The reproduction of sheep. In: Reproduction in Farm Animals. E.S.E. Hafez (ed), 3rd ed. Lea and Febiger, Philadelphia.

THIBAULT, C. and LAVASSEAR, M.C., (1974.) Reproductive life cycle. In: Reproduction in Farm Animals. E.S.E. Hafez (ed.), 3rd ed. Lea and Febiger, Philadelphia.

WILKINSON, K., (1988.) Systat. The System for Statistics. Evanston II: Systat Inc., NY, USA.

Table 1: LEAST SQUARES MEANS OF AVERAGE DAILY GAIN (ADG) CHANGES IN SCROTAL CIRCUMFERENCE (CSC), SCROTAL CIRCUMFERENCE, AGE AND BODY WEIGHT AT PUBERTY (SCPPUB. APUB, AND WTPUB) IN YANKASA RAM LAMBS.

Factor		ADG (g/d)	CSC(cm)	SCPUB (cm)	APUB (days)	WTPUB (KG)
Plane of nutrition	low	66.8±5.49[a]	9.9±1.03	22.6±3.28	239.0±24.67	17.2±1.65[a]
	Medium	77.8±5.57[b]	12.9±1.03	23.9±1.38	227.±21.67	18.6±0.85[b]
	High	89.0±5.62[c]	12.4±1.19	22.1±380	230.7±2.36	19.0±1.39β
Rearing method	Males only	87.6±7.90	11.0±0.99	22.2±3.50	235.0±18.70	18.7±0.99
	Males and females mixed	75.2±4.98	12.5±0.85	23.2±3.03	229.9±18.04	17.8±1.06
Overall mean		79.3±5.87	11.8±0.04	22.7±.10	232.5±13.66	18.3±0.44

a,b,c. Values within each factor and parameter measured with different superscripts differ significantly ($P<0.01$) No letter indicates, for factors and parameters measured, no significant difference in the analysis of variance.