

Reproduction and Production Performance of West African Sheep in Sudan

^{1,2}H.H. Musa, ³F.M. El amin, ¹A.H. Suleiman and ²G.H. Chen

¹Department of Animal Production, Faculty of Veterinary Science, University of Nyala, Sudan

²College of Animal Science and Technology, Yangzhou University, Yangzhou, 225009, China

³Faculty of Animal Production, University of Khartoum, Sudan

Abstract: The study was conducted at University of Nyala Farm. 75 females and 10 males were selected with typical characteristics of the breed to study their reproduction and production traits. Flock statistics for ewes lambing in the winter and wet-summer seasons were recorded and then some reproductive traits were estimated such as conception rate, barrenness rate, fertility, litter size, abortion, lambing rate, twinning rate and male ratio. The mean gestation length was 150.44 ± 2.64 days ranging between 145-156 days. The effect of ewe age on gestation length was non significant ($p > 0.05$). Male and single born lambs had longer gestation period than female and twinborn lambs. Similarly, overall birth weight of lambs was found to be 2.90 ± 0.50 kg, it was 3.18 ± 0.49 kg for males and 2.70 ± 0.41 kg for females. They were weaned at approximately 3 month of age with an average of 11.55 ± 2.19 kg for males and 9.97 ± 2.12 kg for females, single born lambs were heavier than twin born lambs for both sexes. The average pre-weaning growth rate was 90.00 gram per day, males and single born lambs were grew faster than females and twins born lambs. Similarly, growth rate was determined for the periods of 3 to 6, 6 to 9 and 9 to 12 months of age, they observed that single and male lambs exceeded twins and females lambs in growth rate.

Key words: Sheep, reproduction, production

INTRODUCTION

Reproductive performance of Sheep is a major factor in productivity. Lamb performance traits were significantly affected by season of breeding. In the tropics, ewes come in to heat at any time of the year^[1]. Winter born ewe lambs attained sexual maturity at a lower age than those lambs, which were born during the summer^[2]. There are differences between breeds and within the same breed in gestation length^[3]. It increased with increasing age of the ewe up to 4 years of age, it was longer for larger than for smaller litters and male than female lambs^[4]. Flushing was recommended to improve ewe body condition prior to mating by increasing the plane of nutrition^[5]. Older ewes had a better conception rate, lower barrenness rate and higher litter size than the young 2 teeth ewes^[6]. Lamb birth weight is an important factor in sheep production. It is influenced by genetics and environmental factors^[7]. Age of dams had an effect on lamb birth weight^[8], males and Single born lambs were heavier than females and multiple born lambs^[9]. Similarly, type of birth and sex of lambs had a significant effect on pre-weaning growth rate^[10]. While after weaning there were no differences between singles

and twins born lambs in growth rate^[11]. Lambs born in the hot rainy season had the heaviest birth weights compared with those born in other seasons^[12]. This superiority was maintained until weaning^[11]. However, after weaning, winter born lambs grew faster than summer born lambs to 12 months^[13]. In sheep the growth of the young following birth depends mainly on the milk production of the dam as well as her mothering ability. The objectives of this study were to collect performance records and to obtain basic information on West African sheep in Western Sudan.

MATERIALS AND METHODS

Sheep flocks: The study was conducted at the University of Nyala farm in 2002. 75 females and 10 males were selected with typical characteristics of the breed. On arrival at the station, their age was estimated and the state of pregnancy was checked. Twenty four ewes were found pregnant, fourteen ewes died before first mating and 5 ewes died before second mating. Animals were originally classified into age groups on the basis of dentition (Table 1).

Mating plan: Females and males were arranged for mating in four groups, for two mating seasons (Table 2). In each season, the ewes were grouped according to weight and randomly distributed to the breeding rams (Table 2). Animals were flushed for 2 weeks within the mating period (6 weeks). The rams were fitted with a raddle harness and checked regularly to ensure that they were properly fixed in place and color was changed weekly. Ewes observed to have been marked by a ram were recorded^[6]. After the mating period, to prevent extra mating, the method Kunan describe by Sulieman^[7] was used.

Flock management: When the animals arrived at the experimental farm, they were housed in pens in an area of one square meter per animal. Each animal was identified by a plastic ear tag and necklace. They were vaccinated regularly against endemic diseases, drenched and sprayed against internal and external parasites. Feeding was depend mainly on pasture, stored forage and agricultural by products. Supplementary feeding was given only during periods of prolonged dry summer and for suckling and breeding ewes. Lambs at birth and during the first two weeks of age were kept with their dams in pens after ewes return from grazing. Group weaning was practiced at an age of 13 weeks. The nursing ewes were used to suckle lambs, those were rejected by their dams.

Dams records: Dams records included service and lambing date, body weight at mating using a spring balance. Type and sex of birth, numbers of aborting ewes, prenatal and post-natal death were recorded.

Lambs records: Lambs birth weights were recorded after 12 hour post parturition and weekly until they were weaned at 13 weeks of age. After weaning weights were recorded at two weeks interval until Yearling age, body weights were recorded to the nearest 0.10 kg. Since lambs differ in age at weaning, weight was corrected using the following formula:

$$\text{90 day corrected weaning weight} = 90 \text{ day} \frac{(\text{Weaning. wt} - \text{birth}) + \text{birth wt}}{\text{Weaning age}}$$

Data analysis: The data obtained were analyzed statistically using: F-Test for the effect of ewes age on gestation length and Chi square (χ^2) test for the effect of ewe age on Lambing rate.

RESULTS

Reproduction performance: Reproduction performance in this study was based on flock statistics concerned with

Table1: Age distribution and body weight (kg) of foundation flocks

| Age groups | Rams | | Ewes | |
|------------|------|------------------|------|------------------|
| | No. | Average \pm SD | No. | Average \pm SD |
| 1 Pair | 2 | 35.35 \pm 0.55 | 33 | 29.20 \pm 3.80 |
| 2 Pairs | 5 | 43.80 \pm 4.03 | 24 | 30.20 \pm 3.90 |
| 3 Pairs | 3 | 49.53 \pm 2.89 | 4 | 37.58 \pm 2.63 |
| Overall | 10 | 43.83 \pm 5.90 | 61 | 29.79 \pm 4.24 |

Table 2: Number and average body weight (kg) of animals in each mating season

| | 2000 | | 2001 | |
|------------------|------------------|------------|-----------------|------------|
| | Mating season | | | |
| | 7 July-15 August | | 10 April-25 May | |
| Animals | Ewes | Rams | Ewes | Rams |
| No. | 61 | 4 | 56 | 4 |
| Body weight (kg) | 29.80±4.24 | 38.84±2.96 | 34.17±4.68 | 49.60±3.37 |

ewes mated and how many lambed, died during pregnancy, aborted or was barren, the numbers of lambs born (alive and dead) and the numbers of singles and twins. From this statistics some reproductive traits were estimated as conception rate, barrenness rate, fertility rate, litter size, abortions, lambing rate (percentage of present and percentage of pregnant), twinning rate and male ratio, for the winter season lambing were 81.36, 18, 78.69, 1.20, 8.30, 72.13, 91.67, 15.90 and 50.98%, respectively. While for the wet-summer lambing they were 74.10, 51.80, 48.20, 1.10, 3.70, 33.93, 95, 10.50 and 57.10%, respectively (Table 3).

The mean gestation length recorded for 34 experimental ewes was 150.44 \pm 2.64 days ranging between 145-156 days. The effect of ewe age on gestation length was not significant ($p>0.05$). The average gestation length for male-born lambs was 150.95 \pm 2.48 days, while for female born lamb it was 149.50 \pm 2.59 days. In both sexes, single-born lambs had longer gestation period than twin born lambs (Table 4).

Production performance: The overall birth weight of lambs was 2.90 \pm 0.50 kg, the average for males and females were 3.18 \pm 0.49 and 2.70 \pm 0.41 kg, respectively. The adjusted weaned weight of lambs at three months of age, for males was 11.55 \pm 2.19 kg and for females was than females and twins lamb. Post-weaning weight for lambs at 6, 9 and 12 months of age was estimated and presented in (Fig. 1). Male lambs were similar to females during all periods of the year (Fig. 2). On the other hand, body weight for adult rams and ewes was recorded, for rams it ranged between 35.35-49.53 kg with an average of 43.83 kg. While for females, it ranged between 29.20-37.58 kg with an average of 29.79 kg, weight of

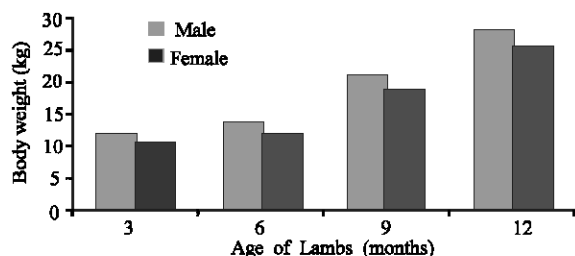


Fig. 1: Post-weaning weight for male and female lambs

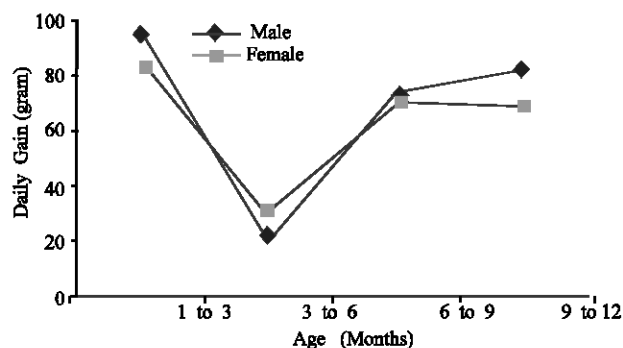


Fig. 2: Post-weaning growth rate for lambs

males and females was shown to increase with the increase in age (Table 1).

DISCUSSION

Reproduction performance: In the present study, ewes that conceived in the wet-summer obtained better lambing in winter than those that conceived in the hot-summer, it was due to inadequate food during the hot-summer periods. Similar result was reported by Sulieman *et al.*^[14]. In contrast, Sulieman and Eissawi^[15] indicated that summer lambing were slightly better than winter lambing. Lambing rate (percentage of ewes present and percentage of ewes pregnant), conception rate and fertility rate for winter and wet-summer lambing in the present study (Table 3) were less than those reported by Sulieman and Eissawi^[15] for Shugor, Dubasi and Watish. Because fertility and fecundity increased progressively as the type of birth of lambs increased from single to triplets^[16]. While, El-hag *et al.*^[17] stated that supplemented ewes had higher ($p < 0.05$) conception rate and lambing rate compared to the control un supplemented ones, also lambing ability was increase with age Sulieman *et al.*^[14]. Barrenness rate was lower in winter lambing than wet-summer lambing.

Abortions were 8.3% for winter and 3.70% for summer lambing. Coop^[18] noted that barrenness is very

Table 3: The effect of season on reproductive performance of ewes

| Parameters | Winter lambing | Wet-summer lambing |
|--------------------|----------------|--------------------|
| Conception rate(%) | 81.23 | 74.10 |
| Barrenness rate(%) | 18.00 | 51.80 |
| Fertility rate(%) | 78.69 | 48.20 |
| Litter size | 1.20 | 1.10 |
| Aborted | 8.30 | 3.70 |
| (%of pregnant) | | |
| Lambing rate | 72.13 | 33.93 |
| (%of present) | | |
| Lambing rate | 91.67 | 5.00 |
| (% of pregnant) | | |
| Twining rate | 15.90 | 10.50 |
| Male ratio | 50.98 | 57.10 |

Table 4: Effect of ewe age, sex and type of birth on gestation length days

| Age | | | | |
|------------|---------|----|---------|-------------------|
| Parameters | | No | Range | Average \pm sd |
| 1pair | | 20 | 147-156 | 150.75 \pm 2.45 |
| 2pairs | | 12 | 145-155 | 149.75 \pm 2.92 |
| 3pairs | | 2 | 150-153 | 151.50 \pm 1.50 |
| Overall | | 34 | 145-156 | 150.44 \pm 2.64 |
| Sex | Type | | | |
| Male | Single | 16 | 148-156 | 151.59 \pm 2.06 |
| | Twin | 4 | 146-149 | 147.30 \pm 1.25 |
| | Overall | 20 | 146-156 | 150.95 \pm 2.48 |
| Female | Single | 9 | 149-154 | 150.70 \pm 2.15 |
| | Twin | 8 | 145-150 | 147.50 \pm 1.98 |
| | Overall | 17 | 145-154 | 149.50 \pm 2.59 |

1, 2 and 3 pairs refer to pairs of permanent incisor

sensitive to mating weight, increasing rapidly with declining weight. Therefore, a minimum of 30 kg body weight was required for successful service and thus conception^[17].

Litter size was less than that estimated by Missohou *et al.*^[19], he found that a 15% increase in body weight was increased the mean litter size. Twining rate was found to be higher in winter lambing than in wet summer lambing (15.90vs 10.50%). This was in agreement with the findings of Sulieman and Eissawi^[15] for Dubasi 15.90% and Watish sheep 15.40%. Furthermore, Coop (18) indicated that the effect was due to age or physiological maturity and the number of pregnancies.

In the present study age of ewes did not affect gestation length. In contrast Nilsson^[4] reported that gestation length increased with increasing age of the ewe up to 4 years of age. The average gestation length for male-born lambs was slightly higher than females and in both sexes singles born lambs had longer gestation periods than twin born lambs (Table 5). This result was in agreement with Newton and Edelsten^[20] and contrary to the result of Sulieman and Eissawi^[15].

Production performance: The overall birth weight of lambs in this experiment was less than Sudan desert sheep breeds (Shugor, Dubasi and Watish)^[21]. Males and Females birth weight was similar to the results of Smith^[9].

Table 5: lambs birth weight, weaning weight and pre-weaning growth rate

| Sex | Type | Birth (kg) | | Weaning (kg) | | Pre-weaning (g) | |
|--------|----------------|------------|------------------|--------------|------------------|-----------------|-------------------|
| | | No | Average \pm sd | No | Average \pm sd | No | Average \pm sd |
| Male | Single | 15 | 3.31 \pm 0.50 | 14 | 11.80 \pm 2.10 | 14 | 98.00 \pm 19.90 |
| | Twin | 4 | 2.70 \pm 0.10 | 3 | 8.00 \pm 0.00 | 3 | 51.00 \pm 0.00 |
| | Overall | 19 | 3.18 \pm 0.49 | 17 | 11.55 \pm 2.19 | 17 | 94.87 \pm 22.60 |
| Female | Single | 10 | 2.96 \pm 0.42 | 8 | 11.00 \pm 1.50 | 8 | 92.63 \pm 12.39 |
| | Twin | 10 | 2.44 \pm 0.16 | 7 | 8.60 \pm 2.10 | 7 | 75.17 \pm 21.37 |
| | Overall | 20 | 2.70 \pm 0.41 | 15 | 9.97 \pm 2.12 | 15 | 85.14 \pm 19.00 |
| | Overall Single | 25 | 3.17 \pm 0.48 | 22 | 11.10 \pm 2.86 | 22 | 96.00 \pm 17.70 |
| | Overall Twin | 14 | 2.51 \pm 0.19 | 10 | 8.50 \pm 1.95 | 10 | 71.70 \pm 21.98 |
| | Overall | 39 | 2.90 \pm 0.50 | 32 | 10.76 \pm 2.27 | 32 | 90.00 \pm 25.54 |

Males were heavier than females, William *et al.*^[22] states for each growth rates male lambs were approximately 17% greater than females. In agreement with^[23] Single born lambs were higher weight than the twin born lambs. Males excelled females in pre-weaning growth rate, this superiority may be female lambs at birth are about 7% but males are only 4 to 5% of their mature body weight^[15]. In agreement with^[24] type of birth was affected pre-weaning daily gain, this difference may be due to competition for milk and birth weight difference.

Lamb weaning weight at 3 months of age in this study was higher than that found by Ngere and Aboagye^[25]. Males and singles were heavier than females and twins. Nawaz and Ahmad^[26] reported that male lambs were 14% heavier than females lambs and similarly twins were 17% lighter at weaning than singles. Post-weaning growth rate was studied according to sex of birth it was similar to the Suleiman *et al.*^[11], there were no difference in growth rate after weaning. The average body weight of adult for males was 43.83 \pm 5.90 kg, while for females it was 29.91 \pm 4.24 kg. In contrast, for the same breed Tielmat *et al.*^[27] reported an average between 27-36 kg for both sexes.

ACKNOWLEDGMENT

The authors wish to express sincere gratitude to Nazer of Fallata A. Samani for experimental animals provided.

REFERENCES

- Payne, W.J.A., 1990. An Introduction to Animal Husbandry in the Tropics. Longman Singapore Publishers (pte) Ltd. pp: 881.
- Suleiman, A.H., 1982. Some reproductive characteristics of female Shugor, Dubasi and Watish sheep reared at El Huda sheep research station. E. Afr. agri. For. J., 47: 49-54.
- Speedy, A.W. and J. Fitzsimons, 1977. The Reproductive Performance of Finnish Landrace \times Dorset Horn and Border Linchester \times Scottish Blackface ewes mated three times in 2 years. Anim.Prod., 24: 189-196.
- Nilsson, K., 1976. Gestation length in ewes. Animal breeding Abstract, 45: 33-83.
- Economides, S., 1983. Intensive Sheep production in the nearest. FAO animal production and health paper, 40: 51-67.
- Elkarim, A.L.A. and J.B. Owen, 1987. Reproductive performance of two types of Sudan desert Sheep. Res. Develop. Agri., 4: 183-187.
- Suleiman, A.H., 1976. Some production traits of Sudan indigenous sheep under irrigated Gezira conditions. M.V. Sc. Thesis. University of Khartoum.
- Suleiman, A.H. and R.T. Wilson, 1989. Productivity of Three Sub-types of Sudanese Desert Sheep at El Huda Research Station, Sudan. In Wilson, R.t and Azeb Melaku (Eds). African Small Ruminant Research and Development. International Livestock Center for Africa : Addis Ababa, pp: 552-564.
- Smith, G.A. 1977. Factors affecting birth weight, Dystocia and pre weaning survival in sheep. J. Anim. Sci., 44: 745-753.
- Tomar, A.K.S., B.S. Mehta, J. Jaishankar, J.S. Gurme and G. Singh, 2000. Genetic studies on growth and greasy fleece yield in Bharat Merino sheep. Indian J. Anim. Sci., 70: 537-539.
- Suleiman, A.H., A.R. Sayers and R.T. Wilson, 1990. Evaluation of Shugor, Dubasi and Watish subtypes of Sudan desert sheep at El Huda National Sheep Research Station, Gezira province, Sudan. ILCA Research Report No. (18) Addis Ababa. Ethiopia., pp: 1-30.
- Yapi, G.C., A. Oya, J.E. Rege and B. Bagnogo, 1997. Analysis of an open nucleus breeding program for Djallonke sheep in the Ivory coast Examination of non-genetic factors. Anim. Sci., 64: 291-300.

13. Karam, H.A., 1959. Birth, weaning and yearling weight of Rahmani Sheep. I. Effects of some environmental factors. II. Heritability estimates and correlation. *Empire. J. Exper. Agri.*, 27: 313-323.
14. Sulieman, A.H., F.M. El Amin and A.H. Osman, 1978. Reproductive performance of Sudan indigenous sheep under irrigated Gezira conditions. *World Rev. Anim. Prod.*, 14: 71-79.
15. Sulieman, A.H. and M.A. Eissawi, 1984. Reproductive performance of some tribal breeds of Sudan Desert sheep under irrigated conditions. *Sudan J. Vet. Sci. Anim. Hus.*, 24: 87-93.
16. Anisworth, L. and N.B. Shrestha, 1987. The reproductive performance of ewe lambs in a controlled environment. *Anim. Prod.*, 44: 233-240.
17. El Hag, F.M., B. Fadlalla and M.A. Elmadih, 1998. Effect of strategic supplementary feeding on ewe productivity under range condition in North Kordfan, Sudan. *Small Rum. Res.*, 30: 67-71.
18. Coop, I.E., 1962. Live weight productivity relationship in sheep. I. Live weight and reproduction. *N. Z. J. Agric. Res.*, 5: 249-264.
19. Missohou, A., B. Bonfoh and A. Kadanga, 1998. Djallonke Sheep at Koloko (Togo): Reproductive traits in ewes and viability of lambs. *Revue.d Elevage-et-de-Medecine. Veterinaire-des-pays. Tropicawx*, 51: 63-67.
20. Newton, J.E. and P.R. Edelsten, 1976. A Model of Effect of Nutrition on Litter Size and Weight in the Pregnant Ewe. *Applied Science Publishers LTD, England*.
21. Mansour, M.E., A.H. Sulieman and I.E. Ali, 1992. A note on growth of some different types of Sudan lambs from birth to weaning. *Sudan J. Anim. Prod.*, 5: 87-91.
22. William, D.H., W.H. Kennick and B. Ralph, 1976. Genetic, environmental and interaction effects in sheep. II. Lamb growth and carcass merit. *J. Anim. Sci.*, 42: 307-316.
23. Bennett, G.L., A.H. Kirton, D.I. Johnson and A.H. Carter, 1991. Genetics and environmental effects on carcass characteristics of South down X Romany Lambs: 1-Growth rate, sex and rearing effects. *J. Anim. Sci.*, 69: 1856-1863.
24. Rodriguez, M., L.N. Huerta, S.M. Ventura, L.J. Rivero and D. Esparza, 1999. Factors affecting performance of cross bred lambs under semi-intensive regimes of production in the very dry tropical environment of Venezuela. *Reviata-de-la-facultad-de-Agronomia, Universidad-del-Zulia*, 16: 64-78.
25. Ngere, L.O. and G. Aboagye, 1981. Reproductive performance of West African Dwarf and Nungua black head Sheep of Ghana. *Anim. Prod.*, 33: 249-252.
26. Nawaz, M. and M.K. Ahmed, 1989. Comparison of Lohi and crossbred ewes productive and reproductive traits. *Small Rum. Res.*, 27: 223-229.
27. Tliemat, F.M., M.F. Wrda and S. Slahab, 1996. *Encyclopedia of Arab sheep breeds*, ACSAD. Damasscus, pp: 296.