A study of some productive traits of a flock of Sudan Nilotic ewes

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SUMMARY

The experiment was conducted to assess the productive potentials of a flock of 42 multiparous and 27 primiparous ewes of the Sudan Nilotic breed. The latter group (Young Ewes, YE) were offsprings from the former (Parent Flock, PF). Each age group was further divided into two subgroups referred to as PF-dura, PF-molasses, YE-dura and YE-molasses according to the diet offered. The two diets were isocaloric and isonitrogenous, formulated from dura and groundnut cake (the dura based diet) or molasses and urea (the molasses based diet) as sources of energy and protein, respectively. Ewes were designated to subgroups in accordance to their age and live weight. The data obtained were examined by 2-way analysis of variance to study the effect of ewes' age and diet treatments. The results showed that age of ewe and the diet treatment had no significant effects on the gestation (150.9±3.1 days), postpartum anoestrus (42.2±16.7 days) and lambing interval (206.1±24.7 days) periods. The experimental groups also showed no significant variations on the number of lambs born/ewe (1.0 to 1.118 lambs born/ewe) and total lambs birth weight/ewe (2.3 to 2.6 kg birth weight of lambs/ewe). Ewes fed on dura-based diet had heavier average lamb weaning weight/ewe (9.9 to 16.3 kg lamb weaning weight/ewe) than their fellow molasses fed mates of the same age group; however the differences were significant ($P<0.05$) only for PF-dura group. Whereas, Index 1 (17.3 to 29.2 kg weaning weight of lambs/ewe/year) of PF-dura group was significantly ($P<0.05$) higher than those of the other three groups, which were similar ($P>0.05$).

Ewes of PF groups had significantly ($P<0.05$) higher Index 2 (0.623 to 0.998 kg lamb's weaning weight/kg ewe's postpartum weight year) and Index 3 (1.426 to 2.312 kg lamb's weaning weight/ ewe's postpartum weight kg ^{75} /year) than their fellow mates of the YE groups. In this context the dura fed groups had higher indices (2 and 3) than their fellow mates fed

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on molasses and the differences were significant ($P<0.05$) only between the PF groups. It was concluded that the Nilotic sheep studied have higher productivity indices due to their higher lambing frequency although they have normal litter size, and that nominates them as a suitable breed for meat production under intensive systems of the Sudan.

INTRODUCTION

Sudanese sheep are known as meat producers. Productivity of sheep is usually determined in terms of litter size, frequency of lambing and live weight of ewe (Wilson, 1986, Charray *et aL*, 1992; and Gordon, 1997).The benefits of the latter parameter are based on lower feeding input of smaller animals. Wilson (1976) calculated the weight of meat produced by Sudan sheep in Southern Darfur at 0.253 kg lamb meat/kg ewe weight. He also noted that this value was higher than that produced by cattle (0.044 kg weaned calf/kg of cow) and lower than that produced by goats (0.374 kg weaned kid/kg of doe). Sandford *et al.*, (1982) calculated three indices to measure the annual productivity of West African dwarf Djallonke ewes (for lambs weaned at 90 days of age) Viz, 8.7 kg weaned lambs/ewe/year (index,1), 0.361 kg weaned lambs/kg of ewe/year (index,2) and 0.850 kg weaned lambs/kg ewe weight$^{\circ.75}$/year (index,3). Sulieman *et al.*, (1990) found that these indices were not different among Shugor, Dubasi and Watish types of Sudan desert sheep when the lambs were weaned at 120 or 150 days of age. The overall mean indices for 120 days age weaned lambs groups were 16.8 kg weaned lamb/ewe/year, 0.419 kg weaned lamb/kg ewes postpartum weight/year and 1.14 kg weaned lamb/kg ewes postpartum metabolic weight/year. They observed that these indices insignificantly increased with the increase of lamb weaning age.

London and Weniger (1996) reported that the three indices were lowest in the primiparous ewes. They also found that the first index was highest at the fifth and sixth parities, whereas, the second and third indices were highest at the second and third parities. The same effect of dams' parity was also reported by Fall *et al.*, (1983), who found that the type of lambing also had an effect on these productivity indices, where twins producing dams were superior to single producing dams.

The objective of this study was to study the productivity of first lamber and multilamber Sudan Nilotic ewes raised under intensive system and fed conventional and non-conventional feeds. This breed of sheep is owned by Shilluk, Dinka and Neur tribes in Southern Sudan (Macleroy, 1961).

MATERIALS AND METHODS

Forty-two ewes designated (PF) of a flock brought from Upper Nile province in Southern Sudan and twenty-seven ewe lambs (YE) of their offsprings were used in this experiment. The PF ewes were admitted into this experiment after successful service whereas the YE group of lambs were taken later into the experiment when they reached sexual maturity and successfully served.

Conventional and non-conventional, isocaloric and isonitrogenous concentrate diets were formulated (Table 1 and Table 2). The former diet was composed of traditional ingredients of crushed sorghum grains as the main source of energy and groundnut cake as a source of protein, whereas, in the latter diet sugar cane molasses and urea were incorporated as sources of energy and nitrogen, respectively. Wheat bran was added to the two diets at different ratios to adjust their total metabolizable energy (ME) and crude protein contents. In addition, sorghum straw was offered separately to the two concentrate diets as roughage. Fresh berseem *(Medicago sativa)* was offered twice weekly at the rate of half kg/head, as a source of carotene. All animals had free access to fresh water and mineral licks.

At commencement of the experiment ewes of the PF group were divided according to live weight into two similar groups of 21 animals each. They were randomly assigned to either dura (PF-dura) or molasses (PF-molasses) concentrate diet. Each of the two groups was further divided into six subgroups (three subgroups of five animals and the remaining three of two animals each) housed and fed in separate pens. The subgroups of the two

Table 1. Ingredients percentage of the experimental diets (as fed basis)

Ingredients	Dura-based diet	Molasses-based diet
Molasses		50
Crushed sorghum grains	50	-
Groundnut cake	25	-
Cotton seed cake		10
Wheat bran	22	34
Urea*		3
Limestone flour	2	2
Common salt	1	1
Total	100	100

** Fertilizer grade 46.6% N.*

Table 2. Chemical composition and energy concentration of the experimental diets (as % of DM)

Particular	Dura-based diet	Molasses-based diet	Sorghum straw
Dry matter	97.9	93.3	94.65
Crude fiber	6.0	5.4	38.45
Ether extract	4.4	1.2	0.88
Crude protein	21.74	21.75	3.43
Ash	9.2	6.75	9.98
Nitrogen free extract	56.56	58.2	41.91
ME,MJ/kg DM*	12.19	11.4	7.36

** Metabolizable energy was calculated according to AWE (1975) formulae:*
For dura and molasses based diets was:
ME 0/IJ/kg DM) = 0.012CP+0.0.31EE+0.005CF+0.014NFE.
For sorghum straw was: ME (MJ/kg DM) = 13.9 — 0.017CF.
Where, CP is crude protein, g/kg DM; EE is ether extract, g/kg DM; CF is crude fiber, g/kg DM; and NEE is nitrogen free extract, g/kg DM

diets were of similar matching live weights. As for ewes of the YE groups, they were introduced into the experiment when they reached sexual maturity and successfully served. Ewes of these groups were admitted into either of the two diet treatments (Molasses or Dura) according to the rations offered to their dams i.e. Molasses to Molasses (YE-molasses) and dura to dura (YE-dura). When all ewes were accommodated into the experiment, they were of 15 and 12 animals in the dura and molasses diet treatments, respectively; each were further divided into six subgroups managed and fed in separate pens. The YE-dura group had three subgroups composed of three animals each and the remaining three subgroups of two animals each. Whereas all the six subgroups of the YE-molasses treatment were of two animals each. Ewes of each subgroup were fed together and offered concentrates at the rate of 0.75 kg/head, and sorghum straw at the rate of one kg/head.

Each experimental age group (PF or YE) was freed with an adult ram daily in the morning for 3 hours throughout the experimental period. During these 3 hours and through close observation, the date of service was recorded. After the ewes showed signs of estrus and accepted the ram they were exposed to the ram again in the evening of the same day to assure service. Ewes in late pregnancy were kept in pens until one week after lambing to be freed with the ram again. Lambs were freed with their dams

until weaning at 90 days of age, during which they were maintained on suckling and creep feeding. Ewes' conception and lambing weights, lamb birth and weaning weights, gestation, postpartum anoestrus and lambing interval periods of ewes successfully lambed and weaned their lambs were studied. Productivity indices were calculated as described by Sulieman *et al.,* (1990) and Sandford *et al,* (1982).

The data were analyzed to study the effect of ewes' age (YE and PF) and type of feed (dura and molasses based diets) using the 2-way analysis of variance as described by StatSoft (1995).

RESULTS AND DISCUSSION

The performance of the experimental groups of PF and YE treatments is presented in Table 3. The type of diet offered and age of ewes had no significant ($P>0.05$) effects on number of lambs/ewe,

total lamb birth weight/ewe, gestation, postpartum anoestrus and lambing interval periods. No significant ($P>0.05$) differences were observed among the groups, live body weights at conception. The overall mean of gestation period (150.9 ± 3.1 days) showed no significant differences due to age or diet treatments. This agreed with the statement of Forbes and Robinson (1967) who reported that the duration of gestation within a particular breed was extremely stable and no obvious decrease in gestation period length with increasing litter size. Similar observations were reported by Khalaffala and Sulieman (1992) for Sudan desert sheep. Consistently Ngere and Aboagye (1981) and Gordon (1997) reported similar gestation period for gimmer and adult ewes.

The total lamb birth weight/ewe was not affected by age of the dam or type of diet treatment and was similar to that reported by Kabaija et al., (1989) for Menz sheep (2.6 to 2.7 kg). The birth weights calculated as percentages of the postpartum dam weight were 8.8, 9.1, 7.9, and 8.9% for PF-dura, PF-molasses, YE-dura and YE-molasses groups, respectively. AFRC (1993) estimated the birth weight of single lambs to be 3.3 kg for 40 kg live weight dams and this has the relative birth weight 8.25% which was approximately similar to that obtained in the present study. However these results were higher than those reported by Ngere and Aboagye (1981) for Nungua Blackhead and West African dwarf lambs (6% and 7%, respectively) and that reported for Sudan desert sheep (7.6%) by Khalafalla and Sulieman (1992). It seemed that the total lamb birth weight produced in the current study is the maximum potential output of these ewes. Moloney et al., (1988) reported that feeding pregnant ewes above 0.46 to 0.5MJ ME/kg

wt0.75 and 7g CP/kg wt0.75 did not add to the lamb birth weight but increased the nitrogen retained on the maternal growth.

The age of ewe or type of feed offered did not exert significant effect on the postpartum anoestrus period (42.2 ± 16.7 days). McDonald et al., (1985) and Shevah et al., (1975) stated that feeding had no effect on resumption of ovarian activity after parturition unless restriction was severe. The postpartum anoestrus period reported here was comparable to 52.4 days for West African dwarf ewes (Charray et al., 1992). Gordon (1997) found that early weaning of lambs reduced the interval to resumption of breeding.

Table 3. Production indices of ewes

Particulars	Parent flock		Young ewes		SE	Sign.
	D. group	M. group	D. group	M. group		
No of animals	17	17	10	1		
Conception weight, kg	20.3	18.5	23.8	22.9	0.958	NS
Lambing weight, kg	29.4[ab]	25.4'	31.6[a]	28.1[10]	1.174	*diet
No. of lambs born/ewe	1118	1.133	1.000	1.100	0.041	NS
Total lamb birth wt kg/ewe	2.6	2.3	2.5	2.5	0.077	NS
Lambing interval days	204.0	204.2	201.1	215.8	3.089	NS
Postpartum anoestrus period, days	46.4	40.8	37.6	38.5	2.208	NS
Gestation period, days	151.2	150.7	150.3	153.5	0.427	NS
Lamb weaning weight, kg/ewe	16.3[a]	11.5[1]	11.9[1]	9.9[b]	0.445	*D, A & Inter
Indexl	29.2[a]	20.3[1]	22.1[b]	17.3[b]	0.857	*D&A
Index2	0.998[a]	0.827[1]	0.712[be]	0.623'	0.028	*D&A
Index3	2.312[a]	1.838'	1.679[1']	1.426'	0.625	*D&A

D. group=Dura based diet group
M. group=Molasses based diet group
SE = Standard error

*D&A, *D, A & Inter = Means on the same row are significantly (P< 0.05) different due to diet and age together or to diet, age and their interaction
a, b, *c* = Means on the same row of different superscripts are significantly (P<0.05) different
Index 1, total weight of weaned lambs/ewe/year:

$$\frac{\text{weight of lambs weaned / ewe} \times .365}{\text{subsequent lambing interval period}}$$

Index 2, the total weight of weaned lambs/kg of ewe weight/year:

$$\frac{\text{Index 1}}{\text{Postpartum ewe's weight}}$$

Index 3, the total weight of weaned lambs/$kg^{\circ.75}$ of ewe weight/year:

$$\frac{\text{Index 1}}{\text{Metabolic postparturn ewe's weight}}$$

The overall mean of lambing interval period was 206.1±24.7 days. Results of lambing intervals were much shorter than 426 and 275.18 days reported for Sudan desert sheep by Sulieman *et al.,* (1990) and Wilson (1976), respectively. Compared with other African breeds, the current results were also shorter than 307±14 days for Djallonke ewes (Sandford *et al.,* 1982), 255±13.5 days for Droper and local Malawi ewes (Kamwanja *et al.,* 1985) and 251.4±73.3 days for Macina wooled sheep (Wilson, 1983).

Ewes of the dura fed groups had higher ($P<0.05$) lambing weights than those fed molasses diet. Consistently the average lamb weaning weight/ewe was heavier for the dura fed groups than their molasses fed mates of the same age group. However the difference was significant ($P<0.05$) only for PF group. Index 1 of the PF-dura group was significantly ($P<0.05$) higher than those of the other three groups, which were similar ($P>0.05$). The weight of lambs weaned/ewe and index 1 were always higher in dura groups but the difference was significant only between the diet groups of PF. The superiority of the dura groups for these parameters was due to their higher milk yield and litter size. Similar observations were reported by Tizikara and Chiboka (1988) in West African dwarf ewes. The results of weaning weight of lambs/ewe obtained here were similar to that reported by Ngere and Aboagye (1981) for Nungua Blackhead and West African dwarf ewes (10.2±3.3 and 8.8±3.3kg/ewe, respectively) and were lower than that reported by Farid *et al.,* (1989) (18.2 kg lambs weaned/ewe). Ewes of PF groups had significantly ($P<0.05$) higher Index 2 and Index 3 than their fellow mates of the YE groups. In this context the dura fed groups had higher indices (2 and 3) than their fellow mates fed on molasses and the differences were significant ($P<0.05$) only between the PF groups. The age of ewes significantly affected index 2 (the total weight of weaned lambs/kg ewe weight/year) and index 3 (the total weight of weaned lamb/kg metabolic ewe weight/year), where PF ewes had significantly higher indices than their fellow mates of the same diet group. This superiority may be due to the higher ewes postpartum weight and the lower lamb weaning weight/ewe of the YE groups.

The type of diet also affected the two indices (2 and 3) but the significant effect was observed only between the PF diet groups. The superiority of the dura groups was observed because of the higher weaning weight of lambs/ewe and the significant differences between the PF diet groups resulted from the higher number of lambs weaned/ewe in the PFdura group.

The lower three indices of the YE groups was also observed by London and Weniger (1996) and Sandford *et al.,* (1982) who reported that the primiparous ewes had lower productivity indices than those of multiparous and this was attributed to the lighter weight of lambs weaned/ewe because of the lesser number of lambs/ewe and the poor mothering ability and milk yield of the primiparous ewes.

The values of the three indices recorded in the present experiment were much higher when compared to those reported by Sulieman *et al.,* (1990) for Sudan desert ewes, however, the weight of lambs was high and lambs were weaned at 150 and 120 days of age. The present indices were higher because of the lighter postpartum weight of ewes and shorter lambing interval period than those of Sudan desert ewes reported. The present results were also superior to that of West African dwarf ewes reported by Sandford *et al.,* (1982) and Fall *et aL,* (1983) and to that of the East African sheep breeds reported by Wilson (1986). The higher indices of the present Nilotic sheep were mainly due to their shorter lambing interval that compensate for normal litter size and smaller weaning weight of lambs. The short lambing interval of the present Nilotic ewes may have resulted from early initiation and resumption of their ovaries activity after parturition, hence short postpartum anoestrus period.

with index 1. The total weaning weight of lambs had significant positive correlations with ewes lambing weight. The three productivity indices correlated significantly and positively with each other's.

Table 4. Correlation coefficients matrix of the parameters under study.

No.	Variables [1]	1	2	3	4	5	6	7	8	9	10
1	Gest. period	1.00									
2	PPanoes. period	-.19	1.00								
3	Lambing interval	-.05	.23	1.00							
4	No of lambs born	-.18	-.09	-.02	1.00						
5	Lamb birth weight	.14	.07	-.22	-.05	1.00					
6	Conception weight	.20	-.10	.03	.03	.44*	1.00				
7	Lamb wean. weight	.08	-.03	-.13	.04	.48*	.17	1.00			
8	Ewes lamb. weight	.08	-.01	-.07	-.00	.57*	.81*	.43*	1.00		
9	Indexl	.09	-.10	-.35*	.03	.52*	.16	.97*	.42*	1.00	
10	Index2	.05	-.09	-.38*	.02	.17	-.32*	.76*	-.18	.80*	1.00
11	Index3	.06	-.10	-.39*	.02	.28*	-.20	.85*	-.02	.89*	.98*

[1] *Variables = Number of variables in rows are the same as those in columns.*
** P< 0.05*

The significant positive correlation between total lamb birth weight/ewe and dams conception weight was similar to that found by Donald and Russel (1970) and Alama (1987).

Fletcher (1971) also reported that increase of suckling frequency correlated positively with the duration of the postpartum anoestrus interval, Accordingly, the present experimental ewes might have a shorter postpartum anoestrus period due to their poor milk yield. This may also explain the non-significant shorter postpartum anoestrus period of the YE ewes that had higher lamb mortality.

It was concluded that Nilotic sheep had higher meat producing ability due to its higher lambing frequency although it has normal litter size. In addition to that, this type of sheep was found to withstand confinement rather than the Sudan desert sheep and this may nominate them to be suitable for intensive mutton production in the Sudan.

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