PUBERAL DEVELOPMENT IN THE NIGERIAN DWARF SHEEP

1. Age and body weight at puberty in ewe lambs

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SUMMARY

THE incidence of the first behavioural oestrus (puberty) in 28 ewe lambs was investigated to determine the effect of the plane of nutrition on it. The ewes were randomly alloted and reared on two planes of nutrition: one exclusively on roughage (grazing and hay) the second roughage supplemented with concentrate at the rate of 454g a day from weaning to puberty.

The ewe lambs were checked for standing heat with two vasectomised rams twice daily — mornings and evenings. The age and body weight at puberty and the average daily gain from weaning to puberty in unsupplemented ewes were 339.5±7.8 days, 14.6±0.9kg and 29.4±4.7g respectively. The corresponding figures for the supplemented ewes were 262.0±16.2 days, 16.2±0.7kg and 73.0±6.6g. The ewe lambs born as singles attained puberty at a younger age but lambs fed supplemented concentrate ration had a significantly higher growth rate and attained puberty at a significantly younger age and higher body weight than ewe lambs fed on roughage only. The durations of early postpuberal oestrus and oestrous cycle were 41.03±2.94 hours and 18.00±0.63 days respectively.

INTRODUCTION

The numerous reports on the age and body weight at puberty in ewes of various breeds of sheep under different environmental conditions have been summarised in a recent review (Dyrmundson 1973).

There is, however, to date no scientific report on the attainment of puberty in the Nigerian Dwarf Sheep. These animals are adapted to the hot wet climate and thus to the heat balance. Climate therefore is most likely to be of little effect although seasonal variations in forage supply could influence physical growth and physiological maturation in the ecological setting of the southern Nigeria Forest zone. The present study was therefore conducted to establish the age and body weight at puberty of the Nigerian Dwarf Sheep and the response of the ewes to improved management.

MATERIALS AND METHODS

Animals

A total of 28 ewes were used in the first phase of the investigation. These were weaned from the breeding flock of the University Farm in two sets:— the first in December/January 1973/74 at an average age of 124.7±7.5 days, range 86-156 days and body weight of 8.14±0.38kg, range

7.5-10.5kg: the second set in October 1974 at an average age of 155.6±6.0 days range 140-175 days and body weight of 8.14±0.54kg, range 7.5-9.5kg.

Another group of 9 ewe lambs (third group, offspring from the first two groups) was used in the second phase of the investigation to determine how much improvement is possible in the age and body weight at the attainment of puberty with properly fed and managed ewe lambs. This group was born in June/July 1975 within the flock, nursed naturally with access to roughages and concentrate and weaned at the age of 100 days and body weight of 9.60±0.63kg, range 7.0-12.5kg. Two 1-year old rams were vasectomised and kept in the flock for this study.

Housing

The animals were housed in semi-open concrete floored pens with sawdust and wood shaving litter. After weaning the first two sets of animals were randomly allocated into two groups, with twins being assigned one to each group as suggested by Dyrmundson (1972).

Experimental

The two groups were assigned randomly to two treatment groups — (a) roughages only and (b) roughage with supplementation.

The third group was also on roughages with supplementation.

Management and Feeding

During the experimentation, the two groups were allowed free grazing in enclosed paddocks of *Cynodon nlemfuensis* (giant star grass)/*Centrosema pubescens* legume pastures all day. Trees along the fence provided shade and browsing for the animal during hot afternoons. Water was available in open drinking troughs in the paddocks. Each ewe lamb was identified by a number tag worn on the neck. They were weighed once a week, just after an all night fast and before grazing in the mornings. In the evenings (1700-1800 hours) the ewes were

Fig. 1. Growth curves of the ewes on the two treatment groups: R + C = Roughages + concentrate; R = Roughages alone.

TABLE 1

Percentage Composition of the Concentrate ration

Ingredient	Percentage Composition
Maize	50.00
Brewers' grain	35.00
Groundnut cake	2.50
Mollasses	2.50
Microzone 23	0.005
Calculated TDN	77.00
Calculated DCP	4.98

Microzone — Crossfields International Ltd. (C_{23}^{A}) contains per kg.
Vit. A, 2.5 M I,U.; Vit. D_3 1.25 M I.U.; Manganese 80 g;
Zinc 60 g; Iron 30 g; Copper 20 g; Cobalt 1.5 g; Iodine 6 g; Magnesium 1000 g.

sorted into their appropriate pens. Cut green fodder of giant star grass mixed with *Centrosema pubescens* legume and sometimes also giant star grass hay on racks, salt licks (Pfizer salt lick) and water were provided *ad libitum* in the pens. One group received additional concentrate ration in open troughs *ad libitum*. The percentage composition of the concentrate ration is shown in Table 1.

Routine health practices like vaccinations, deworming and dipping were carried out.

Heat detection

The two vasectomised rams were used in checking the ewes for behavioural oestrus twice daily — 0600-0700 and 1800-1900 hours, from the beginning of the experiment until the third oestrus post puberty. Both rams were used in each trial, one ram at a time, each staying 20-23 minutes with each group and swopped. All trials were done in the pens, each of size 3m x 5m. The first behavioural oestrus (standing heat) observed in a maiden ewe was accepted as the onset of puberty.

Statistical Analysis

The experiment was analysed in accordance with the methods of Steel and Torrie (1960) for completely randomised designs.

RESULTS

The data from each treatment in both sets of phase one were pooled for consideration since the data followed identical patterns (Table 2). The growth curves of the ewe lambs on the two treatments are presented in Fig. 1. The mean weekly body weight changes of the ewes on supplemental concentrate ration were significantly higher than in the group fed on grass alone. The summary of the age and body weight at puberty of the ewes is presented in Table 2. Ewe lambs on supplemental concentrate ration were significantly younger at puberty than the

TABLE 2

Age and Body Weight at Puberty of the Ewe in the Two Treatment Groups.

Variable	*Treatment groups, Means ± SE (range)*		
	Roughage alone	Roughage & concentrate	t-value
Age at puberty (days)	339.5 ± 7.8 (330-378)	262 ± 16.2 (172-345)	3.25
Body weight at puberty (kg)	14.6 ± 0.9 (12.0-17.0)	16.0 ± 0.7 (11.0-20.0)	1.15
Average daily gain (g) from Weaning to puberty	29.4 ± 4.7 (11.0-44.0)	73.0 ± 6.6 (50.0-125.0)	13.65

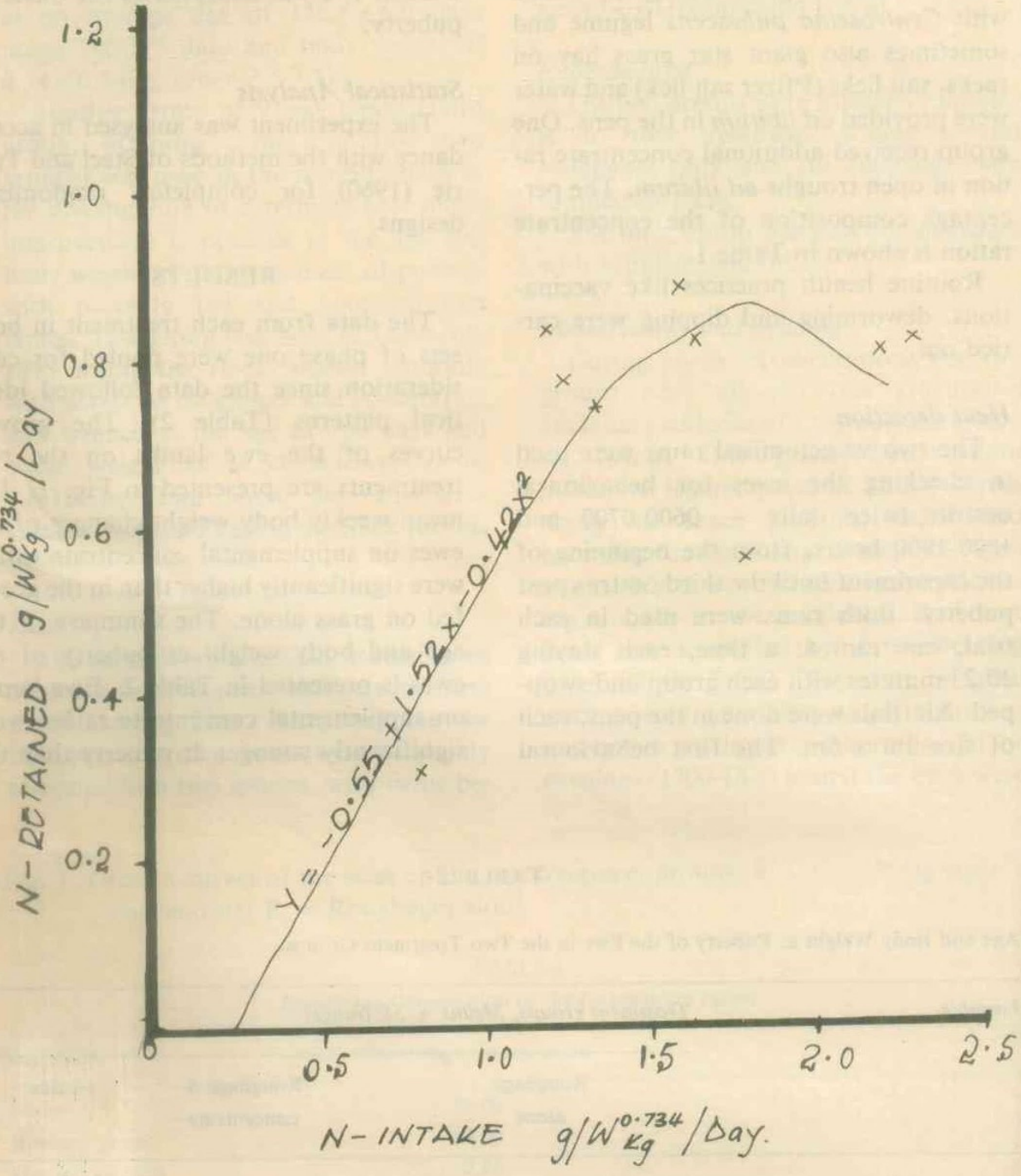

Fig 1: Growth curves of the ewes on the two treatment groups: R + C = Roughages + concentrate; R = Roughages alone.

ewe lambs on roughages alone. The differences in the mean body weights at puberty from the two groups were not significant though the rate of growth, measured as average daily weight gains, was significantly higher in the group on supplemental ration than in that on roughages alone. The log growth coefficient (b = 0.86) was significantly higher in the group fed supplemental ration than

ration but not for the ewes on roughages only (r = 0.46). When all the ewes were however considered the correlation (r = 0.29) was also not significant.

In the second phase, the ewe lambs showed a much more accelerated growth rate which resulted in weaning at a significantly (P 0.05) younger age (100.0 ± 0.45 days) and significantly (P 0.05) higher body weight (9.6 ± 0.63kg) (Table 4) than awe lambs in the first phase. The age at puberty was however not different significantly though slightly lower (226 days) than the age at puverty in the supplemented group in the first set (262 days). This however gave an overall reduction of 36 days from the supplemented group under the first phase and 114 days when compared with the mean value for the group on roughages alone.

The mean duration of the early post-puberal oestrus (first 3 heat periods post puberty) was 41.03 ± 2.94 hours, range 12—156 hours. The coefficent of varibility was 56.47. There was no significant difference (P 0.05) between the duration of oestrus in the supplemented and unsupplemented group.

The length of the first two oestrous cycles was 18.00 ± 0.63 days, range 9—27 days. There was also no significant difference (P 0.05) between the two groups in the length of early post puberal oestrous cycle.

DISCUSSION

In comparison with values published in the review by Dyrmundsson (1973), (Table 5) the age and body weight at puberty observed in the present study further confirm earlier reports that breed and strain differences exist in the age and body weight at first oestrus (Hafez, 1952; Southam, Hulet & Botkin, 1971; Dyrmundsson, 1973). The differences in the age and the body weight of the ewes at first oestrus in the two treatments (with and without supplement) could be accounted for by the differences in the growth rate of the ewes. Previous reports (Hafez, 1952; Allen & Lamming, 1961; Dyrmundsson, 1972) 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 significant negative correlation between the daily weight gain and the age at puberty confirms Joubert's (1973) observation that underfeeding lengthens the physiological time to puberty only. The value of 47 obtained when the average liveweight of the ewes at puberty was expressed as a percentage of their adult weight is lower than the values of 63, 51, 69 and 50—60, obtained for the Scottish Blackface, Suffolk, Rahamani and Clun Forest sheep respectively (Hafez, 1952, 1953; Dyrmundsson, 1972) but higher than 40 per cent in the Romney Marsh (Hafez, 1952) and the generalised figure of 33 of sheep (Rice, 1942). Also, the average value of 779 obtained when the body weight at puberty was expressed as a percentage of the birth weight of the ewe lambs is slightly lower than the average value of 894 per cent reported for sheep in general (Hafez, 1953). The discrepancy in trend between the age and body weight at puberty under the two treatments in the first phase could be partly due to different responses by the ewes to the two nutritional levels and partly due to the differences in the number of ewe lambs involved in both cases. However this discrepancy has also been reported on the Clun Forest sheep (Dyrmundsson, 1972). The results of the present study therefore support the report (Hafez, 1952) that puverty sets in only when animals concerned have attained the degree of

physiological development (usually expressed as liveweight) which at that stage is typical of their breed. In the Nigerian Dwarf Sheep, this falls at about 15kg weight. Age at puberty which in the case of the ewes of the Nigerian Dwarf sheep is at about 266 ± 12 days, thus appears to be more seriously affected by nutritional factors than the liveweight at puberty.

When the growth rates of the ewes in the first and second phases of the experiment were considered, it was seen that the 30.85g daily gain (ADG) from weaning to puberty for the ewes in the second phase was significantly lower than that of the ewes on supplemental ration (73.0g) in the first phase. It therefore suggests that the highly accelerated pre-weaning growth rate had produced enough development to compensate for the reduced growth rate after weaning. The slow pre-weaning growth rate and the lower level of nutrition, consequently lower post-weaning growth rate among the ewe lambs on roughages alone would therefore seem to explain fully the significantly delayed puberty in the ewe lambs fed on roughages alone. The accelerated post-weaning growth rate among the ewe lambs on roughages with supplementation in the first phase could be compensatory growth to make up for the low preweaning growth rate.

Early post-puberal reproductive activity of the ewe lambs measured in terms of the length of oestrus and oestrous cycle fell within the range of values reported in some other breeds of sheep — for the duration of oestrus; 42 (36-48) hours in the Merino sheep (Mckenzie & Terrill, 1937), 36 (24-46) hours in the Suffolk sheep (Hafez, 1952); for the length of oestrous cycle; 16.4 (15-18.5) days in the Scottish sheep (Hadell, 1964) and 17.38 (7-23) days in the Suffolk sheep (Hafez, 1952).

In conclusion, this study has demonstrated the importance of improved nutrition and good management pre and post weaning on the reproductive potential of ewe lambs of the Nigerian Dwarf Sheep. It has been established by studies in other breeds of sheep (Longrig, 1961; Hulet *et al.*, (1969) that ewes bred first as lambs had a higher subsequent reproduction potential and life time production rate than those bred as yearlings. The four months gained in this study through improved feeding and management could therefore lead to the shortening of the age at first lambing and a potential increase in the reproductive life span of the ewes.

TABLE 5

Summary of the Age and Body Weight at Puberty in the Ewes of Selected Breeds of Sheep (culled from Dyrmundsson, 1973).

Breed	n	Location	Age (days)	Body Weight (kg)	References
Clun Forest	159	Wales	232.0	35.5	Dyramundsson (1972)
Romney March	7	England	270.0	34.9	Hafez (1952)
Dorper	108	S. Africa	399.7		Joubert (1963)
Targhee		U.S.A.	217.0	46.1	Southam etal (1970)
Columbia		U.S.A.	217.0	48.3	Ditto
Rahmani	66	U.S.A.	300.8	32.8	Mounib et al (1956)
Nigerian Dwarf	28	Ibadan	267.20	15.6	Current study

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