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GROWTH TRAITS OF YANKASA LAMBS RAISED IN A COMMERCIAL FATTENING RANCH IN SOUTH WEST NIGERIA

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Target audience: Mutton producers and researchers.

ABSTRACT

Sixty Yankasa lambs raised in an Ibadan-based commercial fattening centre between December 1995 and December 1997 were investigated for important growth traits characterizing the indigenous stock. Sources of variation in birth weight, weaning weight and weight at six months of age were investigated to assess their relative significance. There were significant differences between sexes at birth, and between years of birth ($P < 0.05$). There were also significant differences between adjusted weaning weights of male and female Yankasa and between years of weaning ($P < 0.05$). There was no statistical difference between seasons for birth weights while data structure did not permit statement of statistical difference between birth months, birth season and month of weaning. Regression of live weight on age provided prediction equations which reliabilities were indicated by associated coefficient of determinants (R^2). Growth traits are highly variable suggesting that lots of opportunity exist for their improvement through selection.

Key words: Growth traits; Yankasa; fattening ranch; selection.

DESCRIPTION OF PROBLEM

The parameter that is generally used for improving growth rate in temperate breeds of sheep is weaning weight (1). This trait is chosen because the product marketed is meat from lambs slaughtered at weaning. It has moderate heritability of about 0.4 and therefore responds to individual selection, although it may be slower than for post weaning gains or some other traits. In most areas of the tropics including Nigeria, slaughtering is done at older ages. Weaning weight is more dependent on the maternal environment and mothering ability rather than the intrinsic capacity of the animal. In other places, weight at six months of age has been used for selection of animals for growth rate even to later ages because values for genetic correlation between weight at six months and later ages is higher than that for between weaning and later ages. Heritability of live weight at six months of age is also higher than that of weaning, being 0.4 and 0.3 respectively (2). Repeatability of post weaning gains has also been found to be high (3). Weaning is traditionally done at about four months in Uda and Yankasa at live weight of about 18.0 kg (4). Thus if the objective is to improve growth rate at six months and above, as it is in most tropical countries, it is necessary to base selection programmes on live weight at six months of age or higher (5).

Because sheep are used mainly for meat production in Nigeria, rapid growth rate is of considerable importance for efficiency. Lamb's birth weight is of course one of the most important factors influencing growth because a high birth weight confers an initial advantage which, other things being equal, will be maintained at least until weaning (6). Weaning weight is an imprecise measure of growth rate to later stages in the animal's life. This is dependent more on the intrinsic capacity of the animal than on the maternal environment which influences weaning weight (2,7). However, weaning weight in sheep, being about 25 % repeatable, may indicate that culling ewes from the herd on the basis of their first year production is practical (8). A high genetic correlation between birth weight and weaning weight and between weaning weight and weight at six months of age has been established, being 0.34 and 0.53 respectively (3). But because the weight attained at six months include the intrinsic potential of the animal, it is more indicative of eventual matured weight. It is therefore important to study birth weight, weaning weight and live weight at six months of age.

Birth weights can be used to predict weaning weight and weight at six months of age. This is important because it will show how accurately selection done at birth and weaning can predict live weight at six months, later ages and relative significance of non-genetic factors that are important sources of variation in live weight at different growth phases. This is the main thrust of this investigation.

Birth weight has implications also for survival and consequent flock productivity index (FPI) and flock efficiency index (FEI). Yankasa sheep of Nigeria has become an indispensable genetic resource in any attempt to improve sheep contribution to meat production through breeding , especially from indigenous stocks. Its wide distribution, number and size give it a special place. Differential potentialities exist within breed/variety of Yankasa among ecological belts and when this variation is assessed quantitatively, it could become useful information in building a sustainable sheep breeding/improvement programme. It is also the expectation that assessment of the potentials of this sheep under different rearing methods will be valuable for targeting future development initiatives. Inventory and characterization of this sort is mandatory in the quest for exploitable traits for improving the productivity of indigenous sheep among themselves as opposed to the past dependence on exotic breeds which are now being put aside due to economic and adaptability factors.

MATERIALS AND METHODS

Sixty Yankasa lambs born in Ibadan between December 1995 and 1997 and maintained semi-intensively in a commercial fattening ranch were investigated for growth rate within the first twelve months of life. Foundation stock of this herd were obtained from Katsina. Animals were grazed on established pastures containing mainly giant star grass and mucuna legume. After grazing, concentrate supplement containing about 14 % crude protein made from maize and soyabean were offered by weight to ensure a rapid build of live weight. Houses made of concrete were provided for shelter against excessive heat, wind and predators. Slight restrictions were placed on uncontrolled mating as certain rams were 'beloved' on the basis of vigour, body size and general body conformation while others were allowed to run together freely.

Adequate routine medical services were provided, including dipping and deworming. Administration of antibiotics and other veterinary assistance were promptly applied when necessary. Birth weight and monthly live weight of individual lambs were taken. Measurements were usually done before grazing.

Statistical analysis: Least square means (X), standard errors (S.E.) and coefficient of variation (C.V.) were computed for each month from birth to twelve months using a statistical analysis system (9). Mean weaning weights were also adjusted to 120 days. Also, multifactorial analysis of variance was carried out in a 2 x 2 x 12 lay out using SAS ANOVA programme in order to determine the relative significance of each non-genetic factors identified in the study. The general model used was:

$$Y_{ijklm} = \mu + \partial_1 + ß_j + C_k + d_1 + e_{ijklm}$$

where

Y_{ijklm} = individual observation made of individual live weights observed. It was assumed to be random and normally distributed.

μ = Population mean common to all observations. It is assumed fixed and unknown.

∂_1 = Effect of sex on live weight. It is assumed fixed. i = 1,2.

$ß_j$ = Effect of seasons on live weight. It is assumed fixed and to be estimated j = 1,2.

C_k = Effect of month of birth on live weight assumed fixed K = 1, 2......12.

d_1 = Effect of year of birth. It is assumed fixed. 1 = 1, 2.

e_{ijklm} = Random error attributable to individual observations. Assumed to be normally distributed N (O, $\delta^2{}_\varepsilon$)

Regression of live weight on ages at birth and weaning was performed according to the REG Procedure of SAS package. The following linear model was used to fit the curve: $Y = a + bX$

where Y = dependent variable (live weight)

X = independent variable

a and b = Regression constants to be estimated by method of least square

The coefficient of determination (R^2) associated with each equation were also computed.

RESULTS

Birth weight: Descriptive statistics of birth weights are as presented in Table 1. This included the mean birth weight, their associated standard errors and coefficient of variation. Results from this investigation show

Table 1: Mean, Standard deviation and coefficient of variation of monthly live weight

Age (months)	Mean Live Wt (kg)	Standard Deviation (S.D)	Coefficient of varitation (C.V.)%
Birth	3.09	0.87	28.20
1	9.13	2.35	25.70
2	13.97	3.58	24.62
3	18.34	4.43	24.15
4	21.86	5.28	24.15
5	25.17	6.32	25.10
6	28.35	8.11	28.60
7	30.24	9.20	30.42
8	34.39	11.78	31.98
9	37.41	9.21	31.00
10	39.32	10.1[illegible]	31.20
11	40.56	12.14	29.90
12	42.15	14.23	27.80
13	46.60	10.94	19.67

that the lambs gained an average of 6.04 kg between birth and first month and 4.84, 4.37 and 3.52 kg respectively between first and second, second and third and third and fourth months. Analysis of variance showed that there was a significant difference between the birth weight of male and female lambs ($P < 0.05$) giving 3.42 ± 0.82 and 2.86 ± 0.87 respectively (Table 2). There was no significant difference between seasons for this trait. Data size did not permit scientific statement of difference between birth weights due to month of birth. However, year of birth was very important being 3.17 and 2.43 kg for 1996 and 1997 respectively as shown in Table 2.

Weaning weight: Mean weaning weight when adjusted to the common base of 120 days gave 18.38 ± 4.33 kg (Table 1). During this phase, the live weight of the male (20.44 ± 1.60 kg) was significantly different from the weight of female Yankasa (17.25 ± 1.10 kg, Table 3). 24 and 36 records

Table 2 Relative significance of source of variation

Traits	Sex		Season		Year	
	Male	Female	Wet	Dry	1996	1997
Birth Weight	3.4	2.86*	3.17	2.98	3.17	2.43*
Weaning weight	2.44	17.25*	-		27.65	19.4

* = significant at 5%

Table 3: Adjusted Weaning Weight

	Weight (kg)	S.D	C.V(%)
Male	20.44	1 60	7.82
Female	17.25	1.12	6.37
Total	18.84	4.33	23.55

respectively were available for the computation. The nature of available data did not permit the examination of relative significance of season and month of birth for this trait but years of birth were significantly different giving 27.65 ± 0.89 and 19.49 ± 2.10 for 1996 and 1997 respectively (Table 2).

Predictions: Regression analysis yielded prediction equations for the determination of live weight for two phases of growth (0 - 3 and 4 - 6 months of age) as shown in Table 4. Table 5 shows the comparison between actual live weight and predicted live weight in the first six months of life. The regression analysis shows that rate of growth was higher between 0 and three months than between four and six months of age as indicated by the regression coefficient 'b' and the predicted live weight. The proportion of variation determined by the equation as shown by R^2 gave the power of the equation to predict live weights.

Table 4: Prediction Equations

Age (months)	Simple linear Equation	R^2
	$Y = a + bX$	
0-3	$Y = 3.09 + 5.08X$	0.960
4-6	$Y = 5.01 + 4.17X$	0.996

Table 5: Actual and Predicted live weight

Age (months)	Actual Live weight	Predicted Live weight
0 (birth)	3.09	3.25
1	9.13	8.42
2	13.97	13.50
3	18.34	18.58
4	21.86	21.86
5	25.17	25.85
6	28.35	30.02

DISCUSSION

Mean birth weight recorded from this investigation is similar to the report of Adu and Ngere (6) for Katsina and Shika stations. The similarity of these results is probably concerned with the source of the foundation stock used for this investigation apart from being characteristic of the breed. The herd is a fattening commercial one while those of Katsina and Shika were purely research herds. Average daily gain (ADG) of 169.4 , 140.33 and 133 g/day respectively for age ranges 0 - 3, 0 - 6 and 0 - 12 months obtained in this study were slightly higher than the ADG obtained at the Katsina station. This could probably be attributed to the fact that fattening programmes involved higher quality/quantity of feed compared to research stations.

The significant differences found between the sexes at birth show a superiority of the male Yankasa in support of earlier findings (6). Orji (10) had reported that the birth weight of lambs in Nigeria are comparatively low and would appear to contribute significantly to the high pre-weaning mortality often encountered by small ruminant farmers in Nigeria. Of the many factors that have been identified by other workers as being contributory to the characteristic birth weight, type of birth, sex of lamb and season of birth are in congruence with the present results. The absence of seasonal influence resulting from this investigation though at variance with others (6, 10) is probably due to the small sample size per season available for comparison. The earlier report of the faster growth of males over females (8, 11, 12) supports the present findings of a significantly higher weaning weight of males than females and implies that this sex difference at birth was carried to weaning.

Pre-weaning growth rate in indigenous sheep is low with the result that animals are weaned at comparatively lighter weights (12). Thus a live weight of 18.0 kg are obtained at about four months of age in the Uda and Yankasa and is similar to the results of this study. Adu and Ngere (6) reported a live weight of 22.0 kg at six months as opposed to the 28.35 kg of the present study. Older animals apparently have wider variations in live weight between regions as the age increases. This is probably because of more intricate factors that explains their live weights. The high phenotypic correlation between live weight at six months and later ages than between weaning and later ages as reported (3) suggests that live weight of lambs at six months of age is more useful for selection purposes that are focused towards increased growth rate as required in fattening ranches. Reported growth traits of indigenous sheep have wide variations as indicated by the large standard deviation (Table 1) and indicate that considerable opportunity for their improvement still exists.

CONCLUSIONS AND APPLICATIONS

There exists a considerable opportunity to improve live weight at birth, weaning weight and even weight at six months of age as shown by the standard deviation and coefficient of variation values. Intensive and meaningful selection strategies based on sound principles will not only improve these growth traits but also improve their live weight at future age upon which mutton production depends.

It has also been suggested (13) that since animals make their most efficient gain of useful carcass when they are young, the use of yearling animals for mutton production should be adopted as older animals have disproportionately high feed maintenance requirement and their higher gain, which is largely fat, has a poor conversion ratio. Further investigations to appraise the significance of a non-genetic factor that can influence these traits will sharpen breeding and selection strategies that will have national application especially if future investigations are extended to cover other agro-climatic belts/vegetations of the country.

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