AN ANALYSIS OF PREWEANING BODY WEIGHTS IN WEST AFRICAN DWARF GOATS AND THEIR CROSSES

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ABSTRACT

Preweaning performance record of seventy-six West African dwarf (WAD) and WADX Red Sokoto (RS) halfbred kids were compared for production efficiency. Average weight at birth was 1.31±0.01kg for WAD kids and 1.44+0.01kg for halfbreds. At 90 days and 150 days of age, WAD kids weighed 4.87±0.04 and 5.88±0.04kg respectively, while the Red Sokoto halfbred weighed 6.06±0.05kg at 90 days and 7.02±0.04kg at 150 days respectively. On the average, preweaning daily gain was 30.3g/day for the WAD kids and 37g/day for halfbred kids between birth and 150 days of age. Genotype ($P<0.01$) and sex ($P<0.05$) significantly affected weights at birth, 90 days and 150 days of age. Birth type ($P<0.01$) significantly affected weights only at birth. However, season of birth and all first order interactions did not affect weights at any age.

Keywords: Weights, halfbreds, WAD goats, Maternal effects.

INTRODUCTION

Tropical livestock with particular reference to Africa are smaller and less productive than those in temperate region. Attempts at crossing both to improve the performance of the former has not been encouraging as major environmental constraints such as heat stress, respiratory problems and insufficient/seasonal variation in feed supply limit the performance of the crosses (Timon & Baber, 1987; Cunningham and Systard, 1987). However, Timon and Baber, (1987) claimed the existence of possible genetic potentials in the other breeds of goats in West Africa that can be exploited to improve the productivity of the West African dwarf (WAD) goats considering the constraints in the use of temperate breeds. They support their claims with the result obtained in a trial experiment, comparing Vogan sheep (a natural crossbred between the Sahel and WAD sheep) with the WAD sheep. Vogan males had higher growth rate and a heavier adult weight than males of the WAD sheep.

This paper therefore, examines the preweaning performance of the WAD goats compared to their Red Sokoto (RS) halfbreds.

MATERIALS AND METHODS

The data used in this study were obtained from the experiment conducted between 1988 and 1991 at the University of Ibadan Teaching and Research farm. The mating design was both direct and reciprocal and the mating ratio was 7-10 does to a buck. A total of Twenty-six (Sixteen WAD and Ten Red Sokoto) does and Seven (Four WAD and Three Red Sokoto) bucks were used. At the end of the experiment, seventy-six kids (forty-five WAD and thirty-one halfbreds) from forty- eight kiddings were compared for productive potentials.

Management of Kids

All the kids born between 1988 and 1991 in four breeding cycles were allowed to run around and freely suckle their dams. In addition, fresh cow milk supplementation was made available to the kids until they were thirty days old. The kids were also fed concentrates containing 14%CP and 11.70MJ of energy once daily at the rate of 60g/head/day as supplement to dam's milk and legumes between 30 days and 90 days of age when the concentrates supplementation was stopped. However, legumes and forages were made available to the kids until they were 150 days old.

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Movement of kids was restricted within the well ventilated pen for the first 30 days. Litters were changed weekly whenever kids were produced and pens disinfected with asuntol. Kids were dewormed and dipped regularly to eliminate or reduce ecto and endo-parasitic infestions.

Data Preparation

Basic information on breed/genotype, birth type, birth date, sex, sire and dam were kept on each kid in addition to weights at birth, 30, 60, 90, 120 and 150 days of age. Birth weights were obtained within Twenty-four hours of birth. Weights at birth, 90 days and 150 days for breed/genotype groups, birth type, sex and season were then extracted and used.

Analytical Procedures

The effects of breed, season, sex and birth type on body weights at birth, 90 days and 150 days of age were estimated from least squares procedures of unequal sub-class numbers (SAS 1990). The model was as stated in Ebozoje and Ngere (1995)

Maternal Effect

Amongst all prenatal (ovum, cytoplasm and uterine component) and postnatal (Lactation and mothering ability) Maternal factors that exert direct influence on preweaning growth, Lactation yield appear to be the most important influencing preweaning gain by as much as 60% (Jeffery *etal* 1971). In this experiment, the following attempts were made to reduce the influence of dam milk yield and uterine size on the preweaning performance of kids studies.

(1) Direct and reciprocal crossing
(2) Use of does with varying parities (One to five)
(3) Milk supplementation twice daily (birth & 30 days of age).
(4) A kind of creep feed was also given to the kids between 30 and 90 days of age.

An estimate of maternal effect calculated as shown below was deducted from the performance of the crossbreds and tested again for significance along side purebred data at the end of the experiment.

Total maternal effect

$$(TM_{iorij}) = g^m + g^{m'} = \frac{\sum_{\substack{j=1 \\ j \neq i}}^{n} (B_{ji} - B_{ij})}{n}$$

j = RS, i = WAD
g^m = direct maternal effect, $g^{m'}$ = grand maternal effect
n = number of breeds,
B = genotype of kids
B_{ji} = The least means for the genotype class having j as the dam and i as the sire.
B_{ij} = The least square means for the genotype class having i as the dam and j as the sire.

The following assumptions were implied in the use of this model.

(1) The mean of the purebreds were assumed as the population mean such that deviation from the population mean by the crossbred class was assumed to be due to genetic and or maternal effects. (2) The mean of the additive, maternal and grand maternal effects equals zero.

RESULTS:

The estimated least square mean and test of significance for body weights at birth, 90 and 150 days of age by genotype, season, sex and birth type are presented in Tables 1 and 2. The overall mean weights were 1.36±0.01kg at birth 5.37±0.05kg at 90 days and 6.37±0.04kg at 150 days. Breed and sex had significant effects ($P<0.01$ and $P<0.05$ respectively) on weights at all ages, while birth type significantly affected weight only at birth ($P<0.01$). Season of birth effects on weight was not significant at any age. All first order interactions between these variables were also not significant and therefore assumed to be unimportant.

TABLE 1: LEAST SQUARE MEANS, AND TEST OF SIGNIFICANCE FOR WEIGHTS (KG AT BIRTH, 90 DAYS AND 150 DAYS OF AGE)

	BIRTH WEIGHT			90 - DAY WEIGHT			150 - DAY WEIGHT		
VARIABLES	NO.	MEANS	S.E.	NO.	MEANS	S.E.	NO.	MEAN	S.R
Overall Mean	76	1.363	0.018	61	5.37	0.05	58	6.37	0.04
Breed									
WAD	45	1.31^{a}	0.01	35	4.87^{a}	0.04	33	5.88^{a}	0.04
WAD X MARADI	31	1.44^{b}	0.01	26	6.06^{b}	0.05	25	7.02^{b}	0.04
Sex									
Male	38	1.40^{a}	0.01	34	5.46^{a}	0.05	33	6.46^{a}	0.04
Female	38	1.30^{b}	0.01	27	5.28^{b}	0.05	25	6.26^{b}	0.04
Season									
Dry	55	1.37^{a}	0.02	43	5.66^{a}	0.07	41	6.38^{a}	0.06
Rainy	21	1.33^{a}	0.01	18	5.46^{a}	0.06	17	6.45^{a}	0.05
Type of Birth									
Single	34	1.04^{a}	0.01	32	5.51^{a}	0.05	32	6.48^{a}	0.04
Multiple	42	1.23^{b}	0.01	29	5.23^{a}	0.05	26	6.23^{a}	0.04

Colums with same superscripts are not significantly different ($P > 0.05$).

*** $p < .001$ **$p < .01$ *$p < 0.05$

TABLE 2: MEAN SQUARES (M.S.) FROM THE ANALYSIS OF VARIANCE FOR WEIGHTS UP TO 150 DAYS OF AGE.

	BIRTH WEIGHT		90 DAYS WEIGHT		150 DAYS WEIGHT	
SOURCE OF VARIATION	D.F	M.S.	D.F	M.S	D.F	M.S
Breed	1	0.3483***	1	19.5861***	1	13.8916***
Sex	1	0.0244*	1	0.2368*	1	0.1540*
Birth type	1	0.0448**	1	0.0524	1	0.0311
Season	1	0.0139	1	0.0392	1	0.0315
Sex X Birth type	1	0.00092	1	0.1296	1	1.0475
Breed X Season	1	0.0015	1	0.0617	1	0.0012
Error	6.7	0.0049	54	0.0551	51	0.0372

*$p < 0.5$ **$p < 0.01$ ***$p < 0.001$

At birth, WADXRS halfbreds were heavier than WAD kids (1.44.±0.01 kg versus 1.31±0.01kg) by 0.13 kg. This value increased steadily with stages of growth from a minimum of 0.13kg at birth to a maximum of 1.19kg at 90 days (6.06±0.05kg versus 4.87±0.04kg). At 150 days, WADXRS halfbreds weighed 7.02±0.04kg, while WAD kids weighed 5.88±0.04kg (Table 1). Average growth rate was 51kg/day among halfbred kids and 39g/day among WAD kids between birth and 90 days and 37g/day and 30.3g/day respectively between birth and 150 days. A difference of 11g/day and 7g/day respectively. WAD kids grew faster than the halbred kids between 90 and 150 days of age (16.8g/day versus 15.8g/day).

The influence of maternal environment on weights at birth, 90 days, 150 days and average growth rate were not significant. Maternal effects accounted for 0.05kg of average weight at birth, 0.05kg at 90 days, 0.02kg at 150 days and 0.27g/day of average growth rate between birth and 150 days and 0.27g/day of average growth rate between birth and 150 days of age. Males weighed more than females at birth and at subsequent ages until weaning (Table 1). The relative difference of 0.04kg at birth steadily increased to 0.2kg at 150 days. Although birth type did not affect weights at 90 and 150 days of age, kids born as singles weighed more than those born either as twins or triplets (Table 1). Weights at all ages were not affected by seasonal influence. Kids born in the dry season weighed 1.37±0.02kg at birth, while those born in the rainy season weighed 1.33±0.02kg. At 90 days and 150 days, mean weights were slightly different between kids born in both seasons.

DISCUSSION

The average weights observed at birth, 90 days and 150 days in this study fall within the range reported in literature for both WAD and RS goats. According to Ngere (1983) and ILCA (1982), birth weights among Nigerian goats varied from 1.16 to 1.8kg, while weaning weights reported by Sumberg and Mack (1985); Ehoche and Buvanendran (1983) varied from 4.1 to 7.56kg. Genotype differences on the performance of kids steadily increased from 0.13kg at birth to 1.19kg at 90 days in favour of the halfbred kids. Similar results were reported by Ruvuna *et al* (1988) among small east African goats and their Toggenburg, Anglo-Nubian and Galla halfbreds. Average growth rate between birth and 90 days and birth to 150 days showed that halfbred kids grew at a significantly faster rate than the purebreds. The difference in growth rate observed could be associated with the introduction of heterotic advantage resulting from breed combination systems. Crossbreeding combines differences in genetic merit for specific characters to synchronize effective performance characteristics and adaptability resources that are most economical (Fitzhugh *et al* 1975).

Any contribution or influence on phenotype of the offspring attributable to its dam excluding the inherited sample of the nuclear genes of the dam is termed maternal effect (Gregory and Maurer 1991). The contribution of maternal factors to the superior performance of halfbred kids in this study was not significant. Superiority in growth potentials observed among the halfbred kids could therefore be associated purely with genetic differences and combination effects between WAD and the Red Sokoto goats. The performance of halfbred kids in this study is not surprising, since the RS goat is a large breed and grows at a faster rate compared to WAD goats (Ngere, 1983). Breed differences account for between 21.7% to 42.6% additional variation in average daily gain to weaning (Jeffery and Berg 1972).

The relative differences in weights at birth, 90 days and 150 days between single and multiple birth kids although, not significant at 90 days and 150 days agreed with the reports of McDowell and Bove (1977). However, the results of this work contradicted the report of Sacker and Trail (1966). The non-significant effect of birth type on weights at 90 days and 150 days could partly be associated with the management system practised. The relationship between milk yield and preweaning performance accounts for about 60 percent of total variation in average growth rate between birth and weaning and 40 to 50 percent in weaning weights (Jeffery *et al* 1971). The non significant influence of the season of birth on weight changes at any age may lead to the conclusion that differences in seasonality may have no beneficial effect on growth on the long run. Therefore, attempting to introduce seasonal breeding would result in little or no gain. The superiority of males over females at birth, 90 days and 150 days of age agreed with the report of Ruvuna *et al* (1988) in small east African goats and their crossbreds. This could have resulted from longer gestation length normally reported among males which was also observed in this study. Nevertheless, according to Wilson (1978a,b), as male approach sexual maturity they become temperamental, feed intake reduces and gain slows.

In conclusion, WADXRS halfbreds showed superiority and better potentials for growth up to 150 days of age from the results presented above. Such superiority is likely to enhance faster genetic gain enabling faster rate of improvement in total flock productivity. Therefore, the RS goats can conveniently be used in up grading the WAD goats to improve their meat potentials.

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