

Full Length Research Paper

Growth and meat yield of a selected line of rainforest hybrid goat

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Accepted 13 February, 2015

Abstract

The study was conducted to evaluate the growth characteristics and meat yield of a selected line of best performing Red Sokoto (RS) mated to West African Dwarf (WAD) goats in rainforest zone of South-Eastern Nigeria. Previous studies (Nwachukwu *et al*, 2012; 2013) showed that main crossbred RS x WAD progenies outperformed their reciprocal crossbred (WAD x RS) and pure line WAD x WAD counterparts in growth performance and percentage heterosis. In the present study, a total of 54 RSxWAD hybrid kids produced from main crossing of the parental stock were evaluated to revalidate earlier claims. Data obtained showed that at birth, buck kids of the rainforest hybrid goats weighed significantly ($1.72 \pm 0.03\text{kg}$) more than the doe kids ($1.56 \pm 0.40\text{ kg}$). However, subsequent growth data showed that doe kids had equivalent final body weight as the buck kids as well as similar growth parameters at 20 weeks of age. Carcass characteristics were however significantly higher in bucks than does while dressing percentages were similar in both sexes. The correlation coefficients for investigated growth traits showed strong and positive association between body weight and all the body parameters examined. It was therefore concluded that this selected line of rainforest hybrid goats are promising meat goats in the humid tropics which should be further selected until most desirable traits were stabilized and their meat yield potentials were fully realized and exploited in Nigeria and beyond.

Keywords: Rainforest hybrid goat, selected line, growth parameters, meat yield, tropical rainforest

INTRODUCTION

Goats over the years have provided mankind with useful products such as meat, milk, manure, hide and skin and household income. This small ruminant specie are characteristically unique in subsistence animal husbandry due to their adaptability to harsh environmental conditions and universal taste for common local feedstuffs made up of largely roughages and plant by-products (Ebegbulem *et al.*, 2011). The fact that goats

survive in wide range of harsh environments is well known, yet not many of the arid, semi-arid and savannah breeds of indigenous goats thrive well in the humid tropical environment known to experience high precipitation, high relative humidity and importantly high infestation of tsetse fly and trypanosomiasis infection which are serious menace to small and large ruminant animal production. The rainforest zone is a natural habitat for the West African Dwarf (WAD) goat (Bayer, 1986; Osinowo, 1992) and efforts towards developing suitable breed of goat for the area would invariably involve inclusion of such a native breed of goat to minimize the

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Table 1: Percentage composition of concentrate ration fed to breeding goats.

Feed Ingredients	Percentage (%)
Maize offal	50.00
Wheat offal	10.00
Palm kernel cake	30.00
Bone meal	2.00
Soya bean meal	6.50
Oyster shell	1.00
Mineral salt	0.25
Vitamin/ mineral premix	0.25
Total	100.00
% Crude Protein	13.60
ME (Kcal/kg)	2900

consequences of disease and other genotype-environment interactions (Nwachukwu *et al.*, 2013).

The meat yield of indigenous goats are low compared to their exotic counterparts but this situation can be changed through crossbreeding and directional improvement in their prime conformation traits such as bodyweight, other principal body components and carcass indices which are important parameters required in assessing meat animals (Attah *et al.*, 2004). Some investigators (Wilson, 1982; Griffin *et al.*, 1992) had advocated sustainable development of meat goat as a means of improving the quality of life of people in developing countries. Ebegbulem *et al.*, (2011) recommended that the WAD goat should be genetically improved to provide comparable conformational and meat characteristics to the exotic breeds. This proposition is only possible through concerted and sustainable tailored investigation towards genetic improvement of indigenous goat. This underscores the reason for the present study which involves evaluation of genetically selected line of best performing hybrid goats for growth traits and meat yield in the rainforest zone of the South East Nigeria.

MATERIALS AND METHODS

Location of the study: The study was carried out at the Goat Unit of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike. The site is located within the rainforest agro-ecological zone of South Eastern, Nigeria on latitude 05° 28' North, longitude 07° 33' East at an altitude of 122m above sea level. This area has annual precipitation range of 1700-2000 mm per annum, temperature range of 23-36°C and average relative humidity of 75 % during the rainy season and 55 % during the dry season.

Management of Experimental Animals

Breeding animals: The breeding animals were indigenous Red Sokoto (RS) and West African Dwarf (WAD) goats kept in the University livestock farm. The

animals were managed intensively and fed 25 % concentrate and 75 % cut-and-carry forages consisting mainly of *Panicum maximum* and *Calapogonium* spp. Drinking water was provided liberally. The nutrient composition of the concentrate ration is shown in Table 1. The animals were vaccinated against *Peste des petit Ruminants* (PPR) once in 6 months, and dewormed using ivermectin at 3 monthly intervals.

Mating system: Pair wise mating of RS (sire line) and WAD (dam line) goats were carried out to generate RS x WAD hybrid progenies using natural mating. Mating were achieved by monitoring the WAD does for estrus and introducing estrus does to assigned RS bucks for mating. Pregnancy was assumed by a non-return to estrus within one month of pairing with the buck.

Pregnancy, Kidding and Kid management: Pregnant does were kept in individual pens where they received optimal management attention during and after kidding. A total of 54 kids were generated from the crossbred dams. These were left to suckle their dams freely for a period of 16 weeks before weaning. Feeding allowances were made for the number of kids nursed by each dam. Also deworming and vaccination against PPR were carried out on the kids two weeks before weaning. After weaning, kids were managed intensively in units of 3 animals per pen and according to their sexes.

Data Collection

Body Measurement

Kid birth weights (BWT, kg) were recorded individually immediately after kidding using a 10 kg top loading weighing scale. Subsequent body weights were taken on weekly basis. Height- at- withers (HTW) was measured as the distance from the withers to the base of the feet perpendicular to the body axis of the animal. Body length (BLT) was taken as the distance from the shoulder to the pin bone (tuber ischii) while heart girth (HTG) was measured as the circumference of the chest region behind the fore legs. Ear length (EL) was measured on

Table 2: Mean body weight and linear body parameters of rainforest hybrid kids

Parameter	Buck kids	Doe kids
BTW ₀ (kg)	1.72 ± 0.03 ^a	1.56 ± 0.04 ^b
BWT ₁ (kg)	2.07 ± 0.07	1.94 ± 0.09
BWT ₂₀ (kg)	10.10 ± 0.71	9.81 ± 0.45
HTW ₁ (cm)	26.79 ± 0.21	24.89 ± 1.34
HTW ₂₀ (cm)	42.97 ± 1.20	42.76 ± 1.15
HTG ₁ (cm)	27.76 ± 0.23	27.07 ± 0.56
HTG ₂₀ (cm)	45.97 ± 1.20	45.57 ± 1.56
BLT ₁ (cm)	30.67 ± 0.17	30.13 ± 0.41
BLT ₂₀ (cm)	56.06 ± 1.30 ^a	53.69 ± 0.79 ^b
HC ₁ (cm)	21.66 ± 0.21	21.09 ± 0.31
HC ₂₀ (cm)	30.39 ± 0.54	29.21 ± 0.47
EL ₁ (cm)	7.61 ± 0.05	7.23 ± 0.17
EL ₂₀ (cm)	12.63 ± 0.25	12.34 ± 0.18

^{a, b}Means on the same row with different superscripts are significantly different ($P < 0.05$), BTW₀: birth weight, BWT: body weight, HTW: height at withers, HTG: heart girth, BLT: body length, HC: head circumference, EL: ear length.

the dorsal pinnae as the distance from the base to the tip of the ear while head circumference (HC) was taken as the circumference of the broadest region of the head. All morphometric measurements were taken with the Tailor's tape and recorded in centimeters.

Slaughter Operation

Ten male and female animals for carcass evaluation were weighed at 20 weeks of age and slaughtered by severing the jugular vein after stunning using a sharp knife. Thorough bleeding was ensured by suspending the slaughtered animals upside down immediately after severance of the jugular vein. Thereafter, they were decapitated, skinned and the offals removed and all components weighed.

Carcass Measurement

Slaughter weight was obtained as the weight of the animal after been bled, while carcass weight was determined as the weight of the headless, footless, skinned and eviscerated body with the kidneys and kidney fat intact. The dressing percentage was determined on hot carcass basis as ratio of hot carcass weight to slaughter weight expressed in percentage.

STATISTICAL ANALYSIS

Data generated were analyzed using the Students' Independent t-test procedure to compare the effect of sex on measured parameters. Pearson moment correlation analysis was carried out to evaluate association between pairs of traits in each sex.

RESULTS AND DISCUSSION

The birth weight, subsequent body weight changes and linear body measurements of the buck

and doe kids of the rainforest hybrid goat were presented in Table 2.

The birth weight of these kids differed significantly ($P < 0.05$) with buck kids having higher birth weight (1.72 ± 0.03 kg) than doe kids which had mean birth weight of 1.56 ± 0.4 kg. This report is consistent with those of previous workers (Moore, 2000; Turkson *et al.*, 2004). However, subsequent mean body weight changes from week 1 to week 20 did not differ statistically between the sexes. This was contrary to the significant differences in body weight reported for both sexes of the West African hybrid goats by Ozoje and Herbert (1997) and Nwachukwu *et al.* (2013). The implication of equivalent final body weights realized for both sexes in this study was that these meat animals could be slaughtered at the same age. This is desirable characteristics in commercial meat goat operation where uniform weight is often targeted. Table 2 also showed that the linear body parameters did not differ significantly in both sexes except for body length at 20 weeks which was longer in males than females. The non-significant differences in most of the linear body parameters in both sexes was at variance with the report of Ebegbulem *et al.* (2011). This could mean that the rainforest hybrid goat being evaluated hold good promise as potential meat goat which could be developed for commercial meat goat operation.

Table 3 showed the correlation coefficients for measured linear body parameters and body weight of kids.

It was evident from this result that there were significant and positive correlations between body weight and all the linear body measurements investigated. Positive association between body weight and linear body measurements in farm animals had been widely reported in farm animals e.g. rabbits (Chineke, 2005; Akano and Ibe, 2006), cattle (Ibe and Ezekwe, 1994; Russel, 1995) and goats (Ozoje and Herbert, 1997; Nwachukwu *et al.*, 2013). This observation showed that selection for any of

Table 3: Correlation coefficient of body weight and linear body parameters of rainforest hybrid kids at 20 weeks of age

Sex	Parameter				
	BLT	HTG	HTW	HC	EL
Buck kids	0.91 ^{**}	0.91 ^{**}	0.97 ^{**}	0.67 [*]	0.91 ^{**}
Doe kids	0.87 [*]	0.79 [*]	0.89 ^{**}	0.91 [*]	0.67

(P < 0.01), * (P < 0.05).

Table 4: Carcass characteristics of rainforest hybrid kids at 20 weeks of age

Parameter	Sex	
	Male	Female
Pre-slaughter weight (kg)	10.10 ± 0.71	9.81 ± 0.45
Slaughter weight (kg)	9.28 ± 0.28 ^a	8.14 ± 0.15 ^b
Carcass weight (kg)	4.82 ± 0.15 ^a	3.94 ± 0.09 ^b
Offal weight (kg)	4.46 ± 0.13 ^a	4.30 ± 0.07 ^b
Dressing percentage (%)	48.20	47.85

^{a, b}: Means on the same row with different superscripts are significantly different (P < 0.05).

these growth parameters could result in improvement of the phenotypic value of its associating traits.

The carcass characteristics and dressing percentage of WAD buck and doe kids are shown in Table 4.

The buck kids had significantly higher slaughter, carcass and offal weights than doe kids. This may be related to the numerically higher final body weight of buck kids (Kalc *et al.*, 2012). Similar higher slaughter and carcass weight of male kids compared to female kids was reported by Teixeira *et al.* (2011) in CarbitoTansmontano goat kids of Spain. The higher offal weight recorded for buck kids make them the preferred sex of the hybrid goat for the production of this valued 'pepper soup' material which is highly relished by majority of people in Eastern Nigeria. The dressing percent of 48.20 and 47.85 % recorded for buck and doe kids, respectively were within the range of 45 - 49 % reported by Hassan and Idris (2002) and Jibir *et al.* (2012) for growing Red Sokoto and Sahelian goats. Sharma (2003) had noted that the dressing percentage of goats in New Delhi area of India varied from 43 to 48 % depending on breed and management practices applied. The dressing percentages recorded in this study were less than the range of 50 – 51 % reported by Ukanwoko and Onuoha (2011) for WAD goats fed oil palm and leaf meal in the humid tropics and values of 50-52.6 % reported by Ahamefule (2005) for mature WAD goats. However, other investigators in the same ecological zone (Ifut *et al.*, 2011) reported lower values of 38 - 42 % for WAD goats of 9-12 kg live weight. It is obvious that dressing percentage as important as it is in evaluation of meat yield of goat and other farm animals is influenced by such factors as breed, sex of animal, nutrition and other management factors (Kalc *et al.*, 2012).

Conclusion

This selected line of rainforest hybrid goats (bucks and does) showed evidence of uniform performance in growth

and carcass characteristics. This improved performance could be exploited through further selection and possible outcrossing with proven meat type goat to enhance the meat yield potentials of this indigenous line of meat goat in Nigeria.

Acknowledgement

The authors are grateful to the senate of Michael Okpara University of Agriculture Umudike Abia State Nigeria for approving research grant through her Directorate of University Research Administration (DURA) for the execution of this project.

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