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THE EFFECT OF GENOTYPE AND BIRTH TYPE ON GESTATION LENGTH AND LINEAR BODY MEASUREMENTS OF CROSSBRED NIGERIAN GOATS

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ABSTRACT
The research was conducted in Enugu State University of Science and Technology, in the then Abakaliki campus in the Small Ruminant Research and Multiplication Unit, Department of Animal Science and Fisheries. The records were obtained from 60 does of crossbred Nigerian goats from three genotypes (WADG x RSG-main cross; RSG x WADG reciprocal cross and RSG x $F_1 - F_1$ backcross). They were housed and managed under semi-intensive system. The animals were fed with concentrates at 200 – 300g per goat per day and allowed to browse on the university paddock between 1500 – 1700pm. Weekly weights and live body measurements of the kids were recorded from weaning till 20 weeks of age. The results indicate that genotype of the animals and birth type had significant ($P<0.05$) influence on the linear traits and gestation periods of the animals. The crossbred recorded higher values for shin, head circumferences, and ear length. Body weights also had significant effect with the crossbreds displaying superior values ($P<0.05$). Correlation coefficient of the traits was high except for body weight and ear length that negatively correlated ($r = -01$) indicating that other parameters except ear length can be selected for improvement at the same time. It was concluded that Nigerian crossbreed goats are beneficial for increased meat yield and that the significant correlations between body weight and body measurements indicate that they could be used in selection programme.

Key words: genotype, birth types, gestation length, linear measurements, Nigerian goats.

INTRODUCTION

The significant use of linear body measurement of animals has been emphasized in most studies by Tegbe and Olorunju (1988) and Adewumi *et al.* (2006) especially in its use to predict live weight and its body relationship. The broad objective of monitoring linear measurement of live animals is to help describe the size and shape of such animals. It has also been used as tools for characterization of breeds and for evaluation of breed performance (Ozoje and Herbert, 1997). It is also used to study the effect of crossbreeding as a medium for selecting and replacement of animals (Adewumi *et al.*, 2006). Some of the Nigerian goat breed (West African) Dwarf) despite its small size (linear trait) possessed survival traits (both trypano and heat stressed tolerant) which are adaptation to the harsh humid tropical environment. These are advantageous genes (marker genes) that confer immunity to the animals in their highly endemic tsetse fly rainforest zone. Measuring these traits outside the use of conventional weighing and grading methods will serve as most appropriate since it gives adequate descriptions of an individual. Linear traits are vital factor in meat production since it determines the market value of the animals (Ikeobi and Faleti, 1996). The knowledge of the linear traits (body size and shape) of the crossbred of Nigerian goats is very scanty. Against this background, the aim of this study therefore, is to determine the effect of genotype, type of birth, on the gestation length and linear body measurements of Nigerian crossbred goats and the correlation coefficient among the body measure-ments. The assessment of the gestation length and linear traits of such crossbreds as influenced by genotype and type of birth helps to obtain some achievements inherent in the breeds.

MATERIALS AND METHODS

Data used in the work were obtained from (20 months) crossbred of Nigerian indigenous goats. The experiment was conducted at the Department of Animal Science and Fisheries of Enugu State University of Science and Technology, in the then Abakaliki Campus, between 1999 and 2003. The 60 crossbred does were generated from the mating procedures involving:

WADG x RSG (main cross)
RSG x WADG (reciprocal cross)
RSG x F_1 (F_1 back cross)

Management of Animals

Twenty animals were randomly selected from each of the three breeds above. The experimental animals were individually tagged and allowed to roam freely and scavenged on natural pastures within the University from 2 – 6pm each day and returned into confinement for the rest of the day. They were fed at 3% body weight with concentrate. Water and mineral salt were served to the animals regularly. They were vaccinated against *Pestes depetit ruminant* (PPR) and dewormed with Baminth II wormer by the Departmental veterinarian

Linear body measurements

The linear body measurements and body weights were recorded weekly from weaning up to the age of 20 months with the aid of a measuring tape and a ruler as described by Searle *et al.* (1980). The ear length was measured as the distance from the posterior tip (extremity) of the pin bone to the end of it on the head (EL), head length (HL) was the distance between the nasal point and atlas neck bone, and shin circumference (SC) was recorded. Body weights (K_g) were also assessed weekly. The weights were taken through the use of sensitive scale (K_g) of Avery product.

Statistical analysis

The linear measurements as influenced by genotype and birth type were computed using the procedure of Steel and Torrie (1980), to determine the fixed effect. The model used is stated below:

$Y_{ijk} = \mu + B_i + C_j + D_k + E_{ijk}$

Where

Y_{ijk} = record of dependable variable
μ = population mean of goat
B_i = effect of the i^{th} genotype (I = 1 – 3)
C_j = effect of the j^{th} birth type (j = singles twins)
D_k = effect of the k^{th} gestation length (k = 1-4)
E_{ijk} = random error of the degree of association.

RESULTS AND DISCUSSION

The effect of genotype, birth types on linear body measurements are presented in Table 1. The effects of birth type on linear measurements were significantly different on all the linear traits ($P<0.05$). The single birth-type had significant effect ($P<0.05$) on tail length in all the genotypes than the twins. The RSG x F_1 genotype was consistently superior in tail length over other genotypes (Table 1). The WADG x RSG has the least performance record when compared with other breeds and they consistently maintained it in all the linear traits. The superior linear traits of goats kidded single corroborated the reports on WADG goats (Adu *et al.*, 1988; Odubote and Akinokun, 1992 and Akpa 2000) that goats born as single had superior body values than those of twins or triplets. It also agreed with the report of Ozoje and Herbert (1997) that half-breed (WAD x RS) goats were superior in all body parts in all stages of growth. This confirms the face that crossbreeding promotes high growth rate, which also increases body maturity (Jeffrey and Berg, 1972). Gestation length differed significantly ($P<0.05$) amongst the genotype and across the birth type (Table 2). Goats kidded as single had more days of gestation than the twin groups. This rend was maintained in all the genotypes, which implies that twin kidding has the tendency to pre-mature kidding than the single types. However, the overall mean for gestation length indicates that WADG x RSG genotype had longer days of pregnancy than other RSG x WADG ($P<0.05$). From Table, the overall mean weight for birth type indicates that the singles are heavier than the twin born groups. The genotypes mean weight also differed significantly ($P<0.05$) amongst the single kids and twin kidded group ($P<0.05$). The RSG x F_1 had superior genotype mean weight followed by the reciprocal crossbreds (Table 2). The correlation coefficient among the linear body traits for the three genotypes was presented in Table 3. The correlations between body weight and body measurements were highly significant ($P<0.01$), except for the ear length and body weight that negatively correlated ($r = -0.01$). This suggests that as the body weight increases the ear length also decreases. This further suggests that the two traits cannot at the same time be selected for improvement. The significant ($P<0.01$) correlation between ear length and head length (HL) ($r = 0.68$) indicates that the two can be selected at the same time. This also applies for body weight and head length ($r = 0.55$), body weight and shin circumference. This agrees with he earlier report of Buvanendran *et al.* (1980); Raymond *et al.* (1987) and Olutogun *et al.* (2003) that body weight and some linear measurements correlate and the total size of animals are functions of length and

circumference of the body. It implies that selection of one of the traits for improvement would mean increase in the other.

Table 1: Effect of genotype, type of birth, on linear measurements of the experimental animals

Genotypes		Body measurements		
	TB	EL	HL	SC
WADG x RSG	Single	6.70 ± 0.31^{b}	19.4 ± 0.98^{ab}	6.28 ± 0.15^{a}
	Twin	5.89 ± 0.23^{a}	18.27 ± 0.19^{b}	6.30 ± 0.48^{a}
RSG x WADG	Single	8.29 ± 0.23^{b}	18.19 ± 0.33^{b}	7.85 ± 0.22^{b}
	Twin	7.62 ± 0.42^{a}	17.21 ± 0.22^{a}	7.18 ± 0.13^{b}
RSG x F_1 (F_1 backcross)	Single	10.14 ± 0.73^{b}	25.00 ± 0.06^{c}	10.14 ± 0.15^{c}
	Twin	9.12 ± 0.17^{a}	20.58 ± 0.48^{bc}	8.16 ± 0.15^{bc}

TB = birth type; EL = ear length, head length (HC); Sc = Shin circumference; GL = Gestation length
a,b,c = Means with different superscripts in the same columns are significantly different ($P<0.05$)

Table 2: Effect of genotype, birth type, on gestation length (days) and body weight (Kg) of the experimental animals

	Genotypes			
Birth type (TB)	WADG x RSG	RSG x WADG	RSG x F_1	Overall BW mean + S
Single	14.36 ± 0.31	18.77 ± 0.72	23.14 ± 0.21	18.76 ± 0.41^{b}
Twin	13.66 ± 0.34	15.29 ± 0.15	18.38 ± 0.08	15.77 ± 0.19^{a}
Overall Genotype mean ± SE	14.01 ± 0.16^{a}	17.02 ± 0.44^{b}	20.76 ± 0.15^{c}	
Gestation length (GT)				
Single	149.28 ± 6.51^{b}	145.62 ± 7.58	149.71 ± 6.81^{b}	148.20 ± 6.08^{b}
Twin	138.41 ± 6.28^{a}	131.37 ± 9.10	140.11 ± 5.71^{a}	136.63 ± 7.03^{a}
Overall Genotype means ± SE	143.85 ± 6.15^{b}	133.49 ± 9.35^{a}	144.91 ± 596^{b}	

TB = Type of birth; GL = Gestation length, BWT = Birth weight
a,b,c = means with different superscript in the same column (Genotype) are significantly different ($P<0.05$), while means along the row (birth type) birth different superscripts are significantly different ($P<0.05$)

Table 3: Correlation coefficient for body measurements of the experimental animals

	BW	EL	HL	SC
BW	1.00	-		
EL	0.01			
HL	0.55**	0.68**	0.19	
SC	0.05**	0.34**	0.15	-

El = ear length, head length (HC); Sc = Shin circumference; GL = Gestation length, BW = body weight

CONCLUSION

Nigerian goat production constitutes a resource pool, which could be harnessed to enable one to confront the protein malnutrition in the country as a result of serious shortfalls in meat supply. It was noted that Red Sokoto and West African Dwarf goats could be combined for optimal productivity in a commercial herd. The high positive correlation between body weight and, body measurements indicates that they could be used in selection. Single birth born goats recorded superior performance on body weights and linear body measurements than the twin in both weights and linear traits. RSG x F_1 backcross goats achieved superior records on body weights than the other crossbreeds. This genotype should be considered for further genetic improvement. Single birth recorded longer days of gestation than the twin. These further suggest that they will have very low chances of premature kidding (low abortion incidence) than the twin types

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REFERENCES

Adewumi, O.O; Chineke, C.A; Alokan; J.A; Oladipupo, O.A 2006. Effect of genotype and sex on linear body measurement in sheep. Pro. 11th Ann conf. of Awin Ass. Of Nig (ASAN) 18th – 21st Sept. Moor plantation Ibadan, Nigeria, pp 207 – 209.

Adu, I.F., Odeniyi, A.O. and Taiwo, B.A 1988. Production characteristics of a herd of West African Dwarf goats at Ubiaja Bendel State of Nigeria. In: Smith O.B. and Bosman, H.G. (eds) Goat Production in the Humid Tropics. Proceedings of a workshop at the University of Ife 20-24 July, Netherlands pp 140-144.

Akpa, G.N. 2000. Factors affecting growth and body measurements of traditionally anaged Red Sokoto goats. Book of Proceedings of 25th Annual NSAP. Conf. 19-23 March. Umudike pp 262-263.

Buvanendran, V., Umoh J.E and Abubaker B.Y. 1980. An evaluation of body size as related to weight of three West African breeds of cattle in Nigeria Journal of Agricultural Science (Cambridge 95 219-224.

Ikeobi, C.O.N and Faleti, O.A 1996. Factors affecting live weight of goats and sheep in two locations within Ogun State. Nigerian Journal of Animal Production 23(1): 12-15.

Jeffrey, H.B. and Berg, R.I. 1972. Influence of cow size and other factors on weight gain in Beef calves to 365 days of age. Can. Journal of Animal Science 2: 11-29.

Odubote, I. K. and Akinokun J.O. 1992. Estimates of genetic parameters for economic traits in West African Dwarf Goat. Nigerian Journal of Animal Production 19: 114-119.

Olutogun, O. Abdullah, A.R. Raji,O; Adetoro, P.A. and Adeyemi, A. 2003. Body conformation characteristics of white Fulani and Gudali (zebu) cattle breeds of Nigeria. Proceedings of the 8th Annual conference of Animal Science Association of Nigeria, University of Ibadan, Nigeria. pp 8-12.

Ozoje, M.O.and Herbert, U. 1997. Linear measurements of half-bred goats. Nigerian Journal of Animal Production 24:13-19.

Raymond, A.K. Cheah, P.F. and Borjan, A.S 1987. Relationship between body weight and heart girth in crossbred cattle. Malaysian Agric. J. 53 :299-301.

Robinson, J.J., McDonald, I., Fraser, C. and Crafts, R.M.J. 1977. Studies on reproduction in prolific ewe. I. Growth of the products of conception. Journal of Agricultural Science (Cambridge) 88:539-552

Searle, T.N., McGraham, N. and Donnelly, J.B. 1980. Changes of skeletal dimensions during growth in sheep. The effect of nutrition. Journal of Agriculture Science (Cambridge) 112:321-327.

Steel, R. G.D; and Torrie, J.H. 1980. Principles and Procedure of Statistics.2nd edition. McGraw Hill, London UK. 633pp.

Tegbe, T.B.S and Olorunju S.A.S. 1988. The Prediction of live weight of crossbred pigs form three body measurements. Nigerian Journal of animal Production 15:9 –13.