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PHENOTYPIC CORRELATIONS AMONG BODY MEASUREMENTS AND PHYSIOLOGICAL PARAMETERS IN MUTURU AND ZEBU CATTLE

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ABSTRACT

Data on linear body measurements and physiological parameters obtained from 10 matured muturu and 10 zebu cattle were used for this study. The linear body measurements studied include: head to shoulder (HTS), shoulder to tail drop (STD), height at withers (HTW) heart girth (HGT) and body length (BLT), while the physiological parameters include rectal temperature (RT), respiratory rate (RR) and pulse rate (PR). Each of the body parameters in zebu was significantly ($P<0.01$) superior to the muturu cattle. The results obtained from the physiological parameters showed that muturu had significantly ($P<0.01$) higher physiological values than the zebu cattle. The results also showed that there was no significant ($P>0.05$) difference between the pre and post grazing responses of muturu and zebu cattle on physiological parameters. The correlation coefficients among the body parameters were high, positive and highly significant ($P<0.01$) in both muturu and zebu cattle. However, the relationship between the body measurements and physiological parameters were negative and highly significant ($P<0.01$) with values ranging from - 0.44 to- 0.80 in muturu and -0.45 to -0.78 in zebu cattle. The correlations among the physiological parameters were positive and highly significant ($P<0.01$). It was suggested that improvement on non genetic factors such as nutrition and general husbandry management will bring about an improvement in body parameters as well as maintaining the physiological balance of the animal.

Keywords: zebu cattle, muturu cattle, growth performance, body measurement, pulse rate, rectal temperature, respiratory rate.

INTRODUCTION

The importance of body size as a measure of growth in farm animals has led to the measurement of variables associated with body size such as linear body measurements. Linear body measurements have been used to evaluate growth performance and characterize breeds of farm animals (Ozoje and Herbert, 1997; Ogungbayi *et al*., 2003). In addition, the selection of body measurements which have strong genetic correlation with body weight could be a useful selection aid because of the opportunity of indirect selection for weight (Magnabosco *et al*., 2002). This is especially important when scales are not available, a relatively common condition among Nigerian herdsmen. Apart from this, linear body measurements enable the breeder to understand the interrelationship between the body parameters. This is useful in predicting the genetic changes that could result from selecting one of the variables on another. On the other hand, physiological parameters tend to be affected when managing animals during hot weather and its critical values are used as early indicator of stress.

In some cases, physiological parameters are used to predict performance traits in farm animals (Spiers *et al*., 2004). The zebu and muturu cattle are indigenous breeds that are well adapted to the harsh tropical environment. In order to effectively improve on the production potentials of these breeds, there is need to understand their physical body characteristics and their physiological parameters. Information on the relationship between linear body measurements and physiological parameters in muturu and zebu cattle are not available in literatures. This information gap necessitated the interest shown in this study. The objectives of the study are as follows:

a) To compare between zebu and muturu cattle on body measurements and physiological parameters.
b) To compare within breed the pre and post grazing responses of these animals on physiological parameters.
c) To provide estimates of the phenotypic correlations among body measurements and physiological parameters in muturu and zebu cattle.

MATERIALS AND METHODS

The experimental site

The study was conducted in Delta State University, Asaba Campus. The study area lies between latitude 06^0, 4^0 and longitude 06^0, 49^0E in Oshimili South Local Government area of Delta State. Annual rainfall in this area is 1800-3000mm. Temperature range is 28^0C - 31^0C while relative humidity is 69-80% with monthly sunshine of 4.8 bars. (Federal Ministry of Aviation, Department of Meteorological Services, Asaba, 2008).

The experimental animals

This consists of 12 zebu (2 bulls and 10 heifers) and 12 muturu (2 bulls and 10 heifers) raised in the cattle unit of the teaching and research farm, Department of Animal Science, Delta State University, Asaba Campus. The two breeds of cattle were established at the same time and raised to maturity. Only the heifers were used for data collection.

Management of the animals

The animals were allowed to graze on available pasture around the school premises consisting of guinea grass (*Panicum maximum*), elephant grass (*Pennisetum purpureum*), giant star grass (*Cynodon plectostachium*) and other grasses in this area. Grazing was also supplemented with concentrates composed of maize, groundnut cakes, rice bran and brewers dry grain (BDG). Hay was occasionally fed to the animals.

Data collection

Data were collected on the following traits: Head to Shoulder (HTS), the distance from the nose to the point of the shoulder. This was determined using a measuring tape.

Body length (BLT)

The body length of the cattle was measured from the joint of the scapular to the pin bone using a measuring tape.

Height at withers (HTW)

This was determined using a measuring tape. It is the distance from the platform on which the animals stands to the point of its shoulder.

Heart girth (HGT)

This is a circumference measurement taken immediately posterior to the shoulder.

Shoulder to tail drop (STD)

This is the distance from the point of shoulder to the pin bone. It was determined using a measuring tape.

Rectal temperature (RT)

The temperature was taken through the rectum of the animal. It was determined using a clinical thermometer and a stop watch.

Pulse rate (PR)

It was taken from the jugular vein by exacting pressure on the jugular vein and counting per minute.

Respiratory rate (RR)

It was taken manually by counting the flank movement of the animal using a stop watch.

Data on the physiological parameters were taken before grazing at 7.30 am and after grazing at 1.30 pm daily for two weeks. Data on body measurements were taken before grazing on Monday, Wednesday and Friday consistently for two weeks.

Data analysis

The data collected with respect to the body measurements and the physiological parameters were compared between the two breeds of cattle using a T-test. The estimates of phenotypic correlations among the body measurements and physiological parameters were obtained using the method of steel and Torrie (1980).

RESULTS AND DISCUSSIONS

Table-1 shows the comparison between zebu and muturu cattle in some body parameters. The zebu had significantly ($P<0.01$) higher values than muturu cattle in all the body parameters. This may be due to genetic differences between muturu and zebu cattle. Generally muturu is inferior to the zebu in body size (Lasley, 1998).

Table-1. Comparison of the body parameters of zebu and muturu cattle (cm).

Parameters	Zebu	Muturu
Head to shoulder	30.86 ± 0.36^{b}	25.33 ± 0.56^{a}
Hearth girth	60.93 ± 0.77^{b}	47.83 ± 1.24^{a}
Height at withers	51.93 ± 0.39^{b}	37.00 ± 0.28^{a}
Body length	45.86 ± 0.40^{b}	36.67 ± 0.81^{a}
Shoulder to tail drop	39.71 ± 0.39^{b}	31.33 ± 0.89^{a}
For each row value, a<b ($P<0.01$)		

Table-2 compares the zebu and muturu cattle on some physiological parameters. It was observed that muturu recorded a significantly ($P<0.01$) higher rectal temperature, pulse rate than the zebu cattle. This is in line with the report of Finch (1986) that genetic differences exist in the value of physiological parameters in cattle. The rectal temperature observed for zebu and muturu were slightly higher than the normal rectal temperature of cattle which is 38.3^{0c} (Aggrey, 1985). The respiratory rate per minute for zebu and muturu falls within the range of normal respiratory rate for cattle which is 10 - 30 (Wosu, 2003). The pulse rates of the two genetic groups were within the normal pulse rate for cattle which is 50 - 80 per minute (Wosu, 2003).

Table-2. The physiological parameters of zebu and muturu cattle.

Parameters	Zebu	Muturu
Rectal temperature (^{o}C)	38.96 ± 2.09^{a}	39.96 ± 3.08^{b}
Respiratory rate (per minute)	20.36 ± 7.97^{a}	22.86 ± 0.11^{b}
Pulse rate (per minute)	51.52 ± 0.13^{a}	55.68 ± 0.14^{b}
For each row value, a<b ($P<0.01$)		

Table-3 presents the within breed comparison of pre and post grazing responses of cattle to physiological parameters. It will be observed from this

Table that there was no significant (P> 0.05) difference between the pre and post grazing values for the physiological parameters of the two genetic groups of cattle. This implies that grazing does not affect the responses of cattle to respiratory rate, rectal temperature and pulse rate.

Table-3. Within breed comparison of the pre and post grazing responses of cattle to some physiological parameters.

Parameters	Zebu		Muturu	
	Pre-grazing	Post grazing	Pre-grazing	Post grazing
Rectal temperature (^{o}C)	38.91 ± 2.85	39.01 ± 2.95	39.90 ± 5.15	40.01 ± 3.18
Respiratory rate (per minute)	20.12 ± 0.11	20.60 ± 0.11	22.50 ± 0.15	23.25 ± 0.13
Pulse rate (per minute)	51.38 ± 0.18	51.65 ± 0.19	55.39 ± 0.20	55.97 ± 0.18

The phenotypic correlations among the body measurements and physiological parameters are presented in Table-4.

Table-4. Pearsons correlation coefficients among body measurements and physiological parameters in muturu and zebu cattle.

Variables	Breed	HTS	HGT	HTW	STD	BLT	PR	RR	RT
HTS	Muturu	-							
	Zebu	-							
HGT	Muturu	0.89**	-						
	Zebu	0.86**	-						
HTW	Muturu	0.76**	0.87**	-					
	Zebu	0.80**	0.86**	-					
STD	Muturu	0.69**	0.90**	0.83**	-				
	Zebu	0.72**	0.84**	0.76**	-				
BLT	Muturu	0.88**	0.85**	0.84**	0.75**	-			
	Zebu	0.86**	0.82**	0.83**	0.72**	-			
PR	Muturu	-0.45**	-0.44**	-0.69**	-0.45**	-0.50**	-		
	Zebu	-0.46**	-0.45**	-0.67**	-0.46**	-0.43**	-		
RR	Muturu	-0.44**	-0.46**	-0.70**	-0.45**	-0.44*	0.71**	-	
	Zebu	-0.46**	-0.48**	-0.67**	-0.44**	-0.46**	0.82**	-	
RT	Muturu	-0.54**	-0.56**	-0.80**	-0.57**	-0.50**	0.75**	0.74**	-
	Zebu	-0.56**	-0.57**	-0.78**	-0.60**	-0.53**	0.73*	0.71**	-

**P<0.01
HTS: Head to shoulder
HGT: Heart girth
HTW: Height at wither
STD: Shoulder to tail drop
BLT: Body length
PR: Pulse rate
RR: Respiratory rate
RT: Rectal temperature

The phenotypic correlations among the body parameters were high, positive and highly significant (P<0.01) in both muturu and zebu. The correlation coefficients range from 0.69 between HTS and STD to 0.90 between HGT and STD in muturu and 0.72 between HTS and STD to 0.86 between HTS and BLT in zebu cattle. The implication of this is that an improvement in one parameter will give positive response to the other parameter. The high correlation coefficients between HTS, HGT, HTW and STD to BLT in both breeds indicate that any of these body parameters could be used for length measurements. This agrees with the reports of Orheruata and Olutogun (1994) and Olutogun *et al*., (2003) who observed highly significant correlations between HTS,

STD to BLT. The high correlation between HTW and HGT and between HTW and BLT in both breeds could imply that frame size and absolute height were complementary and that the total size of the animal is a function of length, height and circumference measurements (Olutogun *et al.*, 2003). The relationships between the body measurements and physiological parameters were negative and highly significant ($P<0.01$) in both breeds with correlated values of -0.44 between RR and HTS to -0.80 between RT and HTW in muturu and -0.45 between PR and HGT to -0.78 between RT and HTW in zebu This means that any factor that can give rise to an increase in the physiological parameters will have adverse effect on the values of body parameters in cattle. The relationship among the physiological parameters were positive and highly significant with values ranging from 0.71 between RR and PR to 0.75 between RT and PR in muturu and 0.71 between RT and RR to 0.82 between RR and PR in zebu. This means that any factor that will increase the value of one parameter will give rise to an increase in the value of the other.

CONCLUSIONS

From this study, it can be concluded that:

- The zebu cattle were superior to muturu in each of the body parameters. However, the muturu recorded higher physiological values than the zebu cattle;
- Grazing had no significant effect on the physiological parameters of cattle;
- The correlation coefficients among the body parameters were high, positive and highly significant; and
- The correlation coefficients between the body measurements and physiological parameters were negative and highly significant while the correlations among the physiological parameters were positive and highly significant suggesting that any factor that will increase the value of one parameters will give rise to an increase in the value of the other.

Based on the results of this study, it is recommended that any of the body parameters could be used in selection in place of the other parameters. It is also suggested that an improvement of non genetic factors such as nutrition, housing and general husbandry of the animal will bring about improvement in body parameters as well as maintaining the physiological balance of the animal.

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