Relationships Among Live Body Weight and Some Body Measurements in Sudanese Kenana Bulls

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Abstract. The phenotypic relationship between live body weight (kg) and body measurements (cm) for Sudanese bulls is explored. In this research, data from one visit survey were used to estimate the relationships between live body weight and some body measurements of Sudanese Kenana bulls. General linear model analysis with multivariate ANOVA when all physical variables were response and animal live body weight groups (kg) as independent, and simple linear Pearson's correlation were formed between live body weight (Bwt), Heart girth (HG), Heart girth at hump (HTH), Body length (Bl) and Abdominal girth (ABG). The results revealed the best linear correlation between body weight and measurements was heart girth at hump (0.65, 0.66 and 0.73) respectively, for live body weight groups. The obtained linear correlation coefficients were relatively highly accurate indicators of live body weight. This suggests that live body weight could be estimated accurately by body measurements in Sudanese Kenana Bulls.

Keywords: live body weight, body measurements, correlation, Kenana bulls, Sudan

Abstrak. Dikaji hubungan fenotipik antara bobot badan hidup (kg) dengan beberapa ukuran tubuh (cm) pada sapi Sudan. Data diperoleh dari survei untuk menduga hubungan antara bobot badan hidup dengan beberapa ukuran tubuh sapi Kenana Sudan jantan. General Linier Model (GLM) dengan anova multivariat diterapkan pada semua peubah fisik sebagai respon dan kelompok bobot badan hidup ternak (kg) sebagai peubah bebas. Analisis korelasi linier Pearson digunakan untuk bobot hidup tubuh (BWT), lingkar dada (HG), lingkar dada pada punuk (HTH), panjang tubuh (Bl) dan lingkar perut (ABG). Hasil penelitian menunjukkan hubungan linear terbaik antara bobot badan dengan lingkar dada pada punuk masing-masing 0,65, 0,66 dan 0,73 berturut-turut pada kelompok bobot badan. Koefisien korelasi linear yang diperoleh menunjukkan indikator yang relatif akurat dari bobot badan hidup. Hal ini menunjukkan bahwa bobot badan hidup dapat diduga secara akurat dengan ukuran tubuh pada sapi jantan Kenana Sudan.

Kata kunci: bobot hidup badan, ukuran tubuh, korelasi, sapi Kenana, Sudan

Introduction

Estimation of phenotypic correlations between live body weight and body measurements is useful in many management and practices with domestic animals. The importance of body size as a measure of growth in farm animals has led to the physical quantitative measurements of variable associated with the body size such as body measurements. Body measurements have been used to evaluate growth of performance and characterize breeds of farm animals (Ozoje and Herbert, 1997; Ogungbayi et al., 2003). In addition, the selection of body measurements with strong phenotypic and genotypic correlations 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 weighing scales are not available under field condition in Sudan. Kenana cattle are found along the banks of Blue the Nile. Coat color is white to gray and tend to get darker at the

head and feet. The distinctive white gray skin color is stronger in male than female (Abdel, 2007). Kenana cattle are dual purpose breed adapted to harsh climatic conditions. As with all animal species, information on phenotypic correlations among live body weight and body measurements is important in cattle breeding since the correlaton can be used as indicators of the obtained live body weight. The present research was therefore aimed at the determination of certain body measurements in Sudanese Kenana bulls of varying live weights, and to demonstrate the correlations between these body measurements and live body weights by Statistical analysis models. Results obtained in present research would also be valuable to animal breeder and farmers in field involved in cattle research.

Materials and Methods

Research Site

The research was carried out in reputed private cattle ranch at El-Gezira State and some selected villages around, one of the native areas of this local dual purpose animals.

Research Animals

This research administered 75 mature Sudanese Kenana Bulls of varied weights, randomly selected from one visit survey to the local farmers.

Management of Animals

The bulls were managed under a traditional system, in which they freely grazed on the natural range land during the day and return to pens from local materials in the evening where their feeding was supplemented with whole grained and dry grass forage. Fresh water was given ad libitum. The animals were divided into three groups according to live body weights.

Parameters Measured

The live weight of animals and body measurements were determined using Dalton weighing tape from one visit survey. The parameters measured during this research included Live Body weights (LBwt) determined to nearest kilograms using Dalton weighing tape; Heart Girth (HG), a circumferential taken around the chest just behind the front legs and withers, measured to the nearest 0.5 cm; Heart Girth at Hump (HTH), a circumferential taken around the chest and hump just behind the front legs and withers, measured to the nearest 0.5 cm; Abdominal Girth (ABG), a circumferential taken around the abdomen, measured to the nearest nearest 0.5 cm; Body length (BL), the distance from the base of tail to the base of neck. All measurements in this surveyed research were taken in the morning before the animals were fed. Each linear body measurement was recorded in centimeters.

Statistical Analysis

Data collected in this research were subject to various Statistical analysis tools in General Liniear Model (GLM) procedures, univariate analysis of variance and Pearson's correlation using Statistical Packages for Social Sciences (SPSS) release 15.0 (2006) software to compare the relationship among parameters studied.

Results and Discussion

Animal body weight is an important factor associated with several management practices including selection for slaughter and breeding, determining feeding levels and also it is a good indicators of animal condition (Ulutas et al., 2001). Body weight is a frequently recorded variable in animal research, it is the measurements mostly used to evaluate growth (Otte et al., 1992). The biometric physical measurements are used to assess several characteristics of animals. These measurements provide importance evidences for the growth of the animals. In addition, body measurements are important data sources in term of reflecting the breed standards (Riva et al., 2002) and

giving information of morphological structure and development ability of the animals. Live body weights and physical body measurements have been the pivot on which animal production thrives. The knowledge of animal live body weights assessment and in relation with physical body measurements remains the base on which all animal production management practices are hinged. In the present research, least square means and stander errors for live body weight and physical body measurements are presented in Table 1. Bull live body weight according to body weight groups had revealed a significant influences on body weight and measurements (P≤ 0.05). Furthermore, the significant body weight groups differences that existed for all variables studied were separated using post hoc multiple comparisons according to Duncan's multiple range test (DMRT), the significant differences (P≤0.05) between means of groups are marked by various super scripts letters in the same rows.

The correlation is one of the most common and most useful statistics that describes the degree of relationship between two variables. The relationship between body measurements and body weight depends upon breed, age, type, size, condition and fattening level of the animals (Heinrichs et al., 1992; Yanar et al., 1995; Van Marle-Köster et al., 2000) described body measurements as selection criteria for growth in cattle. Maiwashe, (2000) reported that constant checks on the relationships between body measurements and performance traits are vital in selection programmes. Pearson correlation coefficients models of live body weight and body measurements in Kenana bulls (Table 2) showed that there was a significant (P≤0.05) and positive correlation between live body weight and physical body measurements in all classified body weight groups. Live body weight is an important economic trait in the selection of animals. The main purpose of animal breeding is to improve traits of economic value (Mendes et al., 2005). Gilbert et al. (1993) reported that there is close correlation between body weight and body measurements. In the present research live body weight was correlated with heart girth (0.56, 0.55 and 0.45), heart girth at hump (0.65, 0.66 and 0.73), body length (0.32, 0.38 and 0.43) and abdominal girth (0.47, 0.42 and 0.37) respectively for the three classified live body weight groups. The relatively high value of coefficient of correlation between live body weight and heart girth at hump assumed it to be more significant indicators of live body weight in Kenana bulls. The research results regarding live body weight and physical body measurements are in line with the previous findings by Otoikhian et al. (2006) that animals at different stages will have differences in measurements of body parts.

Table 1. Least square (means±SE) of physical variables in Sudanese Kenana bulls according to body weights groups

Variables	N	Body weights groups (kg)			
		Overall (N=75)	(200-254)(N=25)	(255-304)(N=25)	(305-355)(N=25)
Live body weight (kg)	75	274.13±1.92	222.60±3.33^{c}	276.60±3.33^{b}	323.20±3.33^{a}
Heart girth (cm)	75	149.63±0.69	140.82±1.19^{c}	151.48±1.19^{b}	156.58±1.19^{a}
Heart girth at hump (cm)	75	172.85±0.82	160.24±1.42^{c}	173.52±1.42^{b}	184.80±1.42^{a}
Body length (cm)	75	129.15±1.68	121.00±2.89^{b}	132.68±2.89^{a}	133.76±2.89^{a}
Abdominal girth (cm)	75	177.10±1.09	166.42±1.89^{c}	179.02±1.89^{b}	185.86±1.89^{a}

Values bearing different superscripts at the same rows differ significantly (P<0.05)

Table 2. Pearson's phenotypic correlation coefficients of physical variables in Sudanese Kenana bulls according to body weights groups

	Body weights groups(kg)	HG	HGH	Bl	ABG
Live bodyweights	(200-254)	0.56	0.65	0.32	0.47
	(255-304)	0.55	0.66	0.38	0.42
	(305-355)	0.45	0.73	0.43	0.37

HG : heart girth; HGH : heart girth at hump; BL : body length; ABG : abdominal girth

Conclusions

In the present research, certain body measurements of Kenana bulls of varying weighs and the significant correlations between these body measurements and live body weight were obtained. The results support findings of analysis model which was successful in estimating which of the physical measurements were correlated with live body weights. Some physical body measurements, which can be easily measured, is a viable indicator of live body weights and conduct as secondary criteria in selection for improved animal performance such as live body weights of native cattle breeds especially in Sudan. However, further research is needed to investigate the relationship between the live body weight with physical body measurements in the same and different native breeds of cattle in different regions of the country at different independent factors with maximum number of observations (N) for highly accurate findings.

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