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LINEAR BODY MEASUREMENTS AS AN INDICATOR OF KENANA CATTLE MILK PRODUCTION

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ABSTRACT: *Data on (239) females from Kenana cattle population reared in the Um-Benein livestock Research Station and villages around in addition to some areas in the Gezira State were used in this study to determine milk production, the relationship between linear body measurements and between the latter and age and milk production. Traits studied were daily milk yield (DMY), days in milk (DM), height at withers (HTW), heart girth circumference (HGC), abdominal circumference (ABC) and body length (BL) with the ultimate goal to securing a valid indicators of dairy potential of Kenana cattle .The overall means of daily milk yield and days in milk for Kenana cattle were 4.3±0.376 (kg) and 249.98±2.96 days, respectively. Peak daily milk yield was 5.74±0.33 (kg) reach at the third lactation. The correlation coefficients between daily milk yield and linear body measurements were 0.36, 0.20, 0.54 and 0.28 for heart girth, abdominal girth, body length and height at withers, respectively. Prediction equation was derived to estimate milk yield with (0.52) coefficient of determination (R^2). Means daily milk yield (kg) obtained using the estimated method and developed equation using linear body measurement were 4.721±0.162 and 4.705±0.090, respectively. No significant differences (P≤0.05) in means of daily milk yield obtained using the two methods.*

Keywords: *Linear body measurements, milk yield, Kenana cattle, Sudan.*

ORIGINAL ARTICLE

INTRODUCTION

Almost since the beginning of the written history, man has been concerned with the productivity of his farm animals. The physical laws of nature dictate limits within which various body dimensions of our cattle may vary. Animals that are too productive for a particular environment are less well adapted. It is necessary to find animals that are well adapted to the environment of each farm and describe their type by objective measurements such as linear body measurements of different parts of the animals. Defining differences between animals is necessary if genetic progress is to be made. Body measurements allow detection of change that occur in the herd or breed earlier than they may be detected visually. A body measurement therefore quantifies change in animal performance over the time. They serve as supplemental information to performance test results (Bosman, 1997). Livestock in Sudan is characterized by diversity, the wide range of breeds and types of farm animals found in Sudan, in one sense reflect the great heterogeneity of the natural environment in which animal production take place, and the continuing efforts of the producer to obtain a type best suited to own environmental circumstances. Productivity in livestock can be determined using some phenotypic measurements. Using body measurements can be useful in defining performance in many cases. In literature, there are reports showing relationships between body measurements and performance traits (Sieber et al., 1988, and Yanar et al., 2000). Kenana cattle is considered one of the promising dual purpose animal, yet information on their linear body measurements and their relation with performance traits such as milk yield are limited. Hence, this study was conducted to provide essential information on some of these linear body measurements.

MATERIALS AND METHODS

Location of study

The data in this study was collected from Kenana cattle herd at Um-Benein Research Station and villages around it, they were located in Sinnar state on the western bank of the Blue Nile river about 360 km south of

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Khartoum and 9 km south of Singa. It lies between latitude 13° 04 N and longitude 33° 56 E and is 435 meter above sea level. There are three distinct seasons in the year based on rain fall and temperature: Winter (November-February), hot summer (March-June); and wet summer (July-October) with some showers in May and June. In addition to some herds were studied in the Gezira State.

Animals and their management

A total number of 239 Kenana cattle populations were randomly sampled from different areas, including Um-Benein and villages around, in addition to some herds in Gezira State. All the animals were housed in pens fenced by wood materials, steel pipes and sheds of local materials and corrugated zinc sheets. Water was available all the time in steel troughs.

Data collection and Statistical analysis

Data were collected on the following traits: Daily milk yield (DMY) in kilograms, lactation length (Days in milk) and linear body measurements (LBMs) namely, Heart girth circumference (HGC), Abdominal girth circumference (ABGC), Body length (Bl) and Height at withers (HTWs). The linear measurements were measured in centimeters with a Dalton's weighing band. The HGC was measured as the minimal circumference around the body immediately behind the front shoulder; the ABGC was measured as the minimal girth around the body immediately around the abdomen; Bl was the distance from the point of the shoulder to the ischium; HTWs was the widest point at the center of the stifle. The data were compiled according to the age groups (1 to 5) and lactation number (1 to 7). The collected data was subjected to statistical analysis program in the SPSS (1983), using least squares analysis of variance fixed model procedure(Harvey, 1979) model one to find-out the effect of lactation number on milk yield, to find-out a formula for linear regression of linear body measurements (LBMs) namely, Heart girth circumference (HGC), Abdominal girth circumference (ABGC), Body length (Bl) and Height at withers (HTWs) on daily milk yield (kg) and to find-out the persons correlation between linear body measurements and daily milk yield with the ultimate goal to securing a valid indicator of potential of the Kenana cattle.

The residual mean square was used as the random error term to test the significance of differences among groups.

The general model fits the data was: $Y_{ijkl} = \mu + A_j + L_k + H_l + e_{ijkl}$

Where:

Y_{ijkl} = The trait studied (Daily milk yield).
μ = The overall mean underlying the trait.
A_j = The effect of j^{th} age (for j = 1...5).
L_k = The effect of k^{th} lactation number (for k = 1...7)
H_l = The effect l^{th} of herd (for l = 1...3).
e_{ijkl} =The random error term (All factors considered fixed except for the random error term).

RESULTS AND DISCUSSION

Significances of body weight, milk yield and body measurements in dairy cattle breeds have been studied by a number of researchers. Most of the investigators reported that larger and longer cows produced higher amount of milk (Harville and Henderson, 1983; Kerr et al., 1985; Sieber et al., 1988; Glunski and Litwinczuk, 1999; Yanar et al., 2000).

Also genetic and phenotypic relationships among body weight, body measurements and milk production have been investigated by several authors (Baginda et al., 1985; Moore et al., 1991; Akbulut et al., 1998), but results have been inconsistent.

The effect of age on Kenana cattle breed was also observed. Age was found to have a high significant differences ($P<0.05$) on daily milk yield and lactation length of the animals.

Means and standard error of daily milk yield and lactation length are presented in Table 1. The daily milk yield in this study was 4.30 ± 0.38 the lactation length was 249.98 ± 2.97 days which was lower than that reported by Abdalla et al. (1990) 283.00 ± 40.00 days for the same breed at Um-Benein livestock Research Station.In general, daily milk yield and lactation length incraeased as age advanced and then decreased for animals in age group >10yrs. The effect of herd on kenana cattle was also observed. Herd was found to have a significant differences ($P<0.05$) on daily milk yield and lactation length. The values are shown in Table1. Means and standard errors for daily milk yield and lactation length by two methods were tabulated in Table 2. The values were not statistically significant ($P<0.05$). Table.3 contains least square means of estimated daily milk yield according to lactation numbers (1^{st} to$>6^{th}$), showed that the peak daily milk yield was reached in third lactation (5.75 kg) which was similar to that reported by Osman, 1970; Elkhidir et al., 1979, this results was higher than that reported by Osman (1972) for Northern Zebu cattle in range and lower than the reported one by Osman (1970) for the same cattle breed. Differences among means while the mean multiple comparison was performed using Duncan multiple range test for daily milk yield according to lactation numbers were statistically significant ($P<0.05$).

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Table 1 - Least square means (means±SE) of Some productive traits of Kenana cattle according to age groups and herds

Factor	NO	Daily milk(kg)	Lactation length(days)
Overall	239	4.30±0.38	249.98±2.97
Age (yrs.):			
3-4 yrs.	02	2.76±1.67	210.00±31.30
5-7 yrs.	52	4.91±0.34	238.57±6.88
8-10 yrs.	82	5.71±0.26	255.36±5.29
>10 yrs.	103	3.47±0.70	248.25±19.43
Herds:			
Um-Benein	156	3.22±0.36	248.67±3.54
El-Managil	46	7.47±0.50	260.22±6.61
Wad-Medani	37	6.01±0.35	241.00±8.19

Table 2 - Least square means (means±SE) of some productive traits of Kenana cattle using equation and scale

Factor	NO	Daily milk (kg)	Lactation length (days)
Overall	62	5.09±0.70	238.6.60±6.50
Equation	31	5.17±0.99	238.9.66±9.66
Scale	31	5.01±0.95	238.25±9.25

Table 3 - Least square means (means±SE) of milk yield of Kenana cattle by lactation numbers

Factor	NO	Daily milk(kg)
Lactations		
1th	22	3.78±0.52abc
2th	43	4.78±0.37a
3th	54	5.75±0.33abc
4th	56	4.76±0.32bcd
5th	32	4.50±0.43de
6th	22	3.59±0.52de
>6th	10	3.69±1.73cd
Overall	239	4.19±0.43

Means with the same letter not significantly different (P>0.05). Different letters denote significant difference at (P<0.05).

Phenotypic correlation coefficients between linear body measurements and daily milk yield are presented in Table 4. Generally, there were positive correlation between milk yield and all linear body measurements. Correlation values between all linear body measurements and daily milk yield were statistically significant (P<0.01). The results indicated that phenotypicaly longer cows had higher milk yield, and the results was similar to previous reports (Moore et al., 1991; Glunski and Litwnczuk, 1999). Also the longer cows tend to be efficient as smaller ones. The results were in accordance with findings of Hooven et al. (1968), Dickinson et al. (1969) and Sieber et al. (1988).

Table 4 - Phenotypic correlation coefficient between daily milk yield and linear body measurements of Kenana cattle breed.

Parameters	Heart Girth (cm)	Abdominal Girth (cm)	Body length (cm)	Height at withers (cm)
Daily milk yield (kg)	0.36**	0.22**	0.54**	0.28**

** Correlation is significant at the (0.01) level (2- tailed).

Table 5 presents the results of regression analysis, in which linear expression of all body measurements were used in all age groups to predict contemporary daily milk yield. The predicting relationship of daily milk yield and linear body measurements was determinate by regressing daily milk yield of the animal on linear body measurements of Heart girth, abdominal girth, Body length and Height at withers. There were highly and significant (P<0.05) regression coefficients between these body measurements and daily milk yield for the lactation studied. The relationships were further ranked according to t- values, Table 5.

The best relationship with daily milk yield in Kenana cattle is body length (t=7.67) followed by heart girth (t=1.85), abdominal girth (t=0.72) and height at withers (t=0.124). Regression equation was also derived to predict daily milk yield in different lactation in Kenana cattle breed. The relatively high accuracy of prediction equation obtained in this study suggested that regression equation was sufficient to use in prediction of daily milk yield from

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linear body measurements in Kenana cattle breed. However, more studies are needed to emphasis this statement. This is advantageous especially in Sudan.

Table 5 - Coefficients associated with regression of daily milk yield (kg) on linear body measurements (cm) of Kenana cattle breed

Model	Beta	SE	t value	sig.
1 (constant)	-18.526	3.720	- 4.976	0.000
Abdominal girth (cm)	0.00	0.012	0.724	0.470
Height at withers (cm)	0.004	0.033	0.124	0.901
Body length (cm)	0.171	0.022	7.670	0.000
Heart girth (cm)	0.042	0.023	1.850	0.060

Predicted equation: $\hat{Y}$ = -18.526 + 0.009 (ABG) – 0.004 (HTWs) + 0.171 (Bl) + 0.043 (HG), (R^2 = 0.52)

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, findings in this study shows that Body length (cm) can best be indicator to predict daily milk yield of Kenana cattle breed using regression equation. Also, Age played a major role on animal performance. Also found those lactation numbers have effect on daily milk yield of animal as it tends to increase in advanced with lactations. It also concludes and recommends that linear body measurements should be necessary to consider their contribution to cattle performance prediction in improvement programs for commercial production.

REFERENCES:

Abdalla EA, Khalafalla, AM and Mand Shafei SA (1990). The influence of age on lactation length and milk yield in Kenana and Butana cows. Sudan J. Anim. 3: 93-100.

Akbulut O, Tuzemen N, Yanar M and Aydin (1998). Esmer sigirarda erken donem canli agirlik ve vucut olculerinni ilk laktasyon sut verimi ozellikleri iliskisi. Ataurk Univ. Ziraat Fak. Dergisi, 29: 250 – 258.

Baginda L, Wilcox RJ and Thatcher WW (1985). Interrelationships of milk yield, body weight and reproductive performance. J. Dairy Sci., 68: 1228 – 1231.

Bosman DJ and Harwin, GO (1997). Variation between herds in respet of influence of year, sex, season and age of cow on weaning weight of beef cows. Pro. S. Afri. Anim. Prod 6: 213.

Dickinson FN, McDaniel Bt and McDowell RE (1969). Comparative efficiency of feed utilization during first lactation of Ayrshire, Brown Swiss and Holstein cows. J. Dairy Sci., 52: 489–497.

El Khidir OA, Khalifa HAA, Khalafala AM and Gaili ESE (1979). II- Age at first calving and effect of improved nutrition on body development and sexual maturity. Sonderdruck aus Zeitschrift fur Tierzuchtung und Zuchtungbilogie Bd. 96,210.

Glunski P and Litwinczuk Z (1999). An evaluation of the relationships between type and dairy performance in Polish Black and white cows. Animal Breeding Abstract, 67: 3419.

Harvey WR (1979). User's guide for SML, 76: Mixed Model Least Squares and Maximum Likelihood computer program of Ohio State University. Columbus, USA.

Harville DA and Henderson CR (1983). Interrelationships between body size and milk production. J. Animal Sci., 57:849 (Sup.2).

Hooven NW, Miller RH and Plowman RD (1968). Genetic and environmental relationships among efficiency, yield, consumption and weight of Holstein cows. J. Dairy Sci., 51: 1409-1419.

Moore RK, Kennedy BW, Schaeffer LR and Moxley JE (1991). Relationships between age and body weight at calving and production in first lactation ayrshire and Holstein. J. Dairy Sci., 74: 269-278.

Osman AH (1970).Genetic analysis of dairy milk yield in a dairy herd of northern Sudan Zebu cattle. Trop. Agric. (Trinidad) 47: 205- 213.

Osman AH (1972). Studies on Sudanese indigenous cattle II. Environmental factors influencing reproduction rates and milk production under range condition. J. Trop. Agric., (Trinidad). 94: 143-150.

Sieber M, Freeman AE and DH Kelley (1988). Relationships between body measurements, body weight and productivity in Holstein dairy cows. J. Dairy Sci., 3437-3445.

SPSS (1983). Statistical Package for Social Sciences Inc. (1983), SPSS user's guide. Mc Graw Hill, New York, USA. 988 PP.

Yanar M, Aydin R and Ugur F (2000). Relationships of body measurements with milk production traits in Brown Swiss cattle. Ind. J. Dairy Sci., 53: 444-447.