RELATIONSHIPS BETWEEN BODY MEASUREMENT OF DAIRY CALVES AT SIX MONTH OF AGES AND AGE AT FIRST CALVING AND MILK PRODUCTION

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ABSTRACT

In this research, the relationships of between body measurements such as heart girth, body length, height at withers and chest depth at six month of ages of calves and their age at first calving and the first lactation 305- day milk yield were investigated. Interrelationship the mentioned states were investigated too by using canonical correlation analysis. No statistically significant (P>0.05) relations were found between the evaluated traits.

KEYWORDS: cattle, milk production, body measurement

INTRODUCTION

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 [1, 4]. Many of these studies emphasised the relationship between body measurements and the performance during lactation. However, taking body measurements earlier than first lactation may have benefits because the animals can be selected in the young age.

The present study was undertaken to investigate relationships between body measurements such as heart girth (HG), body length (BL), height at withers (WH) and chest depth (CD) taken at six month of ages of calves and their age at first calving (AFC) and the first lactation 305-day milk yield (305-dMY).

MATERIALS AND METHODS

30 female Brown Swiss and Holstein Friesian cattle reared in the Research Farm of Agricultural Faculty at Ataturk University, Turkey were used in this study. Animals included in the study were subjected to the same feeding and management practice during the experiment. Body measurements as HG (circumference of the thoracic cavity immediately behind the fore limbs), BL (from point of the shoulder to the point of tuber ischii), WH (from base of hoof to the highest point of the withers) and CD (from sternum area immediately caudal to the fore limbs to top of thoracic vertebra area) were determined at six months of ages. The 305-dMY from each animal were calculated using the second method reported by IKEWM [5].

The data concerning AFC and 305-dMY were standardised in terms of calving year, breed and calving season. Then, interrelationship between body measurements with the AFC and 305-dMY were investigated by using canonical correlation analysis [6,7]. Canonical correlation analysis was used to investigate the relationships between two variable sets. In this research, two data sets were used. Data set 1 included HG, BL, WH and CD variables. Data set 2 included AFC and 305-dMY variables. The goal of canonical correlation analysis is to evaluate the relative contribution of each variable to the derived canonical functions in order to explain nature of the relationship(s). Consider the following two equations:

$$U_m = a_{m1}X_1 + a_{m2}X_2 + ... + a_{mp}X_p \quad (1)$$

$$V_m = b_{m1}Y_1 + b_{m2}Y_2 + ... + b_{mp}Y_p \quad (2)$$

Equation (1) and (2) gives the new variables U_m and V_m which are a linear combination of the X (set 1) and Y (set 2) variables, respectively. Let C_m be the correlation between U_m and V_m. The objective of canonical correlation is to estimate a_{m1}, a_{m2}... a_{mp} and b_{m1}, b_{m2}... b_{mp} such that C_m is maximum. Equation (1) and (2) are the canonical equations, U_m and V_m are the canonical variates, and C_m is the canonical correlation. The data were statistically analysed by SAS program [8].

RESULTS AND DISCUSSION

As a result of the canonical correlation analysis, the equations for the calculation of U1 = - 0.359WH + 0.045HG + 0.408BL – 0.017CD for WH, HG, BL and CD traits and V1 = - 0.162 (AFC) – 0.001 (305-dMY) for AFC and 305-dMY were produced (P= 0.094). When the coefficients of U1 and V1 canonical variables were examined, the largest contributions to the formation of U1 were BL and WH, whereas the smallest contribution came from CD with the contribution of 0.017. The contribution of AFC in the formation of V1 was the largest.

Signs of WH (-0.359) and AFC (- 0.162) were both negative. This indicated that calves with large values of WH at six months of age had large AFC values as well. AFC values indicated age of the cows at first calving, which means that increased WH values translates into delayed births. A similar relationship existed between WH and 305-dMY, which indicated that animals with large values of WH had higher milk yields. Animals with higher CD values had higher AFC values and 305-dMY values. Least squares means for HG, BL, WH, CD, AFC and 305-d MY were also presented in Table 1.

Table 1.Least squares means and their standard errors (SE) for traits.

Traits	Mean	SE
HG, cm	112.1	3.6
BL, cm	87.2	0.9
WH, cm	87.1	1.0
CD, cm	37.3	0.3
AFC, mo	34.8	0.5
305- dMY, kg	2964.0	158.0

There is an inverse relationship between BL and AFC. Those who had very high BL values and at 6 months of age delivered their calves earlier and the 305-dMY values of these animals were found lower. However, all the relationships mentioned above were not statistically significant (P= 0.094). In conclusion, it is not possible to predict AFC and 305-dMY values of animals by looking at WH, HG, BL and CD values at the age of six months of life.

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