



Research Article

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# THE EFFECT OF MATERNAL AGE ON SOME BODY MEASUREMENTS IN ANATOLIAN BLACK CALVES

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## Abstract

Birth weight is one of the most important parameters affecting the growth, improvement and yield of the calves in cattle breeding. The aim of this study is to research the effect of maternal age, gender of calf and birth year on some body measurements such as rump height, body length, chest girth, front wrist girth, rump breadth, chest breadth, chest depth and birth weight of calves of Anatolian Black Cattle which is one of the domestic cattle breeds with the widest living range in Turkey. In this study, some body measurements of 58 Anatolian Black calves borned between the year 2015-2017 in the herd of protection of genetic resources at Lalahan International Center for Livestock Research And Training were evaluated. The effect of maternal age was found statistically significant ( $p < 0.05$ ) only on chest girth, while the effect of gender was found significant on chest girth, front wrist girth and birth weight. The effect of birth year was not found statistically significant on all body measurements examined in this study. However, when maternal age is divided into two groups as group one (under 5 year age) and group two (over and equal 5 year age) the effect of maternal age was found significant ( $p < 0.05$ ) on chest girth, front wrist girth and birth weight in female calves and significant ( $p < 0.05$ ) on body length, chest girth and birth weight in male calves.

**Keywords:** Anatolian black cattle, Birth weight, Maternal age, Body measurements

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## 1. Introduction

Anatolian Black Cattle breed is the domestic cattle breed which has widest living range in Turkey. They are grown extensively on mountainous regions, terrestrial climate, primitive maintenance, feeding and barn conditions, especially at Central Anatolia. It is a cattle breed that is highly resistant to insufficient care and feeding conditions, has a high resistance against diseases and has

a developed maternal instinct. The Anatolian Black Cattle has been conserved as live at outside of their natural habitat (ex situ in vivo) since 1995 at the Directorate of Lalahan International Center for Livestock Research and Training via the Project for the Conservation of Domestic Genetic Resources conducted by the General Directorate of Agricultural Research and Policies (TAGEM). In addition, since 2005, it also has been conserving at their natural habitat (in situ).

In cattle breeding, as a measure of growth and development, various body measurements are taken as basis. The most important of these parameters is birth weight. Birth weight is an important factor affecting postnatal growth and development and progeny, milk and meat yield at later ages. Therefore, it is also of great importance in economic terms. Other body measurements are also factors that are effective except Birth Weight (Akbulut et al., 2001; Bilgiç and Aliç 2004; Karabulut et al., 2012; Wu et al., 2004).

There are several factors that have effect on the birth weight and body measurements of a calf. These are discussed in two main groups as genetic and environmental factors. While Genetic factors can be listed as breed and sex, environmental factors can be listed as maternal age, birthing season, gestation, maternal weight, number of offspring in the birth, and care-nutrition. Maternal age is one of the important factors that has effect on growth in the calves (Arpacık, 1982; Souza et al., 1994; Kaygısız, 1998; Tilki et al., 2003; Guaragna et al., 1990; Altinel, 1985).

In several researches which Brown Swiss cattle was used, it was reported that the effect of maternal age on birth weight was statistically significant ( $p < 0.05$ ) (Villalba et al., 2000; Kaygısız, 1998; Akbulut et al., 2001). Demirhan and Tekerli (2008) found it statistically significant that the effect of parity on birth weight ( $p < 0.05$ ) and withers height ( $p < 0.01$ ) in the study of Anatolian Black Cattle.

In this study, the effects of maternal age, gender of calf and birth year on withers height, rump height, body length, chest girth, front wrist girth, rump breadth, chest breadth, chest depth and birth weight of calves were evaluated in Anatolian Black Cattle in the herd of conservation of genetic resources at the Lalahan International Center for

Livestock Research and Training.

## 2. Materials and Methods

In this study, the data belonging to the herd of Anatolian Black Cattle created within the scope of Genetic Resources Conservation Project at the Directorate of Lalahan International Center for Livestock Research and Training were used. A total of 58 Anatolian black calves born during the period of 2015-2017 were evaluated in the study.

Body measurements such as withers height, rump height, body length, chest girth, front wrist girth, rump breadth, chest breadth, chest depth and birth weight of Anatolian Black calves and the data of maternal age were examined. Parameters belonging to calves were taken within 24 hours after birth. For data of the maternal age, the Herd Registration Book at the Cattle Breeding Department was utilized. The birth weights of the calves were measured by an electronic scale sensitive to 200 g, other body measurements were measured by measuring stick and tape measure. They were all measured by the same technical personnel.

Measurements obtained in the study and basic statistical values of the maternal age were determined. Variance analysis of the measurement parameters was done. The relationship between body measurements and maternal age, gender of calf and birth year was determined by "Pearson Correlation". Statistical calculations were done with "Minitab 16" package program.

## 3. Results and Discussion

The mean values of body measurements of calves according to the gender are given in Table 1.

**Table 1.** The mean values of body measurements of calves according to the birth years (Mean±SEM)

Birth Year	Gender	n	Withers Height (Cm)	Rump Height (Cm)	Body Length (Cm)	Chest Girth (Cm)	Front Wrist Girth (Cm)	Rump Breadth (Cm)	Chest Breadth (Cm)	Chest Depth (Cm)	Birth Weight (Kg)
2015	Female	8	57.00±1.161	60.69±1.470	55.19±1.727	60.81±1.395	8.63±0.183	9.94±0.240	13.88±0.363	20.06±1.230	17.88±1.010
2015	Male	9	58.39±1.394	63.28±1.648	54.72±2.597	63.22±1.489	9.28±0.252	9.50±0.236	13.83±0.464	20.78±1.007	20.38±1.445
2016	Female	8	58.81±0.940	62.06±0.918	52.63±1.945	60.63±1.899	8.13±0.206	9.56±0.175	13.63±0.460	20.44±0.664	18.13±1.246
2016	Male	15	60.40±0.814	65.40±0.827	54.03±1.313	60.57±1.011	8.83±0.093	10.00±0.162	14.33±0.252	20.03±0.404	19.87±0.810
2017	Female	9	57.39±1.184	61.67±1.047	48.72±0.878	56.89±1.139	7.83±0.186	9.22±0.121	13.44±0.549	18.94±0.779	15.89±0.716
2017	Male	9	59.50±1.190	63.11±1.130	52.00±2.297	60.11±1.736	8.80±0.210	10.00±0.250	13.39±0.380	19.94±0.598	19.44±1.260

The significance rating according to the least squares method of maternal age, birth year and gender factors of body measurements in Anatolian Black calves are given in Table 2. In the results of variance analysis performed on these data, it was determined that the effect of maternal age was found statistically significant ( $p < 0.05$ ) only on chest girth but the effect of gender was found significant on chest girth, front wrist girth and birth weight.

In studies conducted with the same breed, Demirhan and Tekerli (2008) found that the effect of parity on Withers Height and Front Wrist Girth was very significant ( $p < 0.01$ ), on birth weight was significant ( $p < 0.05$ ) and on body length and chest girth was not significant. Kılıçel and Tepeli (2014) reported that the effect of maternal age on birth weight, chest girth and Withers Height was

statistically significant ( $p < 0.05$ ) in cows that gave two or more birth.

When compared with studies conducted in the same race Kılıçel and Tepeli (2014) found that the gender effect on birth weight, chest girth, body length and withers height was not statistically significant. On the other hand Demirhan and Tekerli (2008) found that the gender effect on birth weight and front wrist girth was statistically significant ( $p < 0.05$ ) while on chest girth, body length and withers height was not significant. Also it is reported that the birth weight of Anatolian black calves is higher than that of female calves (Anonymous 2004).

The effect of birth year was not found statistically significant on all body measurements examined in this study. However Demirhan and Tekerli (2008) reported

that the effect of birth year on birth weight and front wrist girth was statistically significant ( $p < 0.05$ ).

**Table 2.** The significance ratings (P Value) according to the least squares method of maternal age, birth year and gender factors of body measurements.

Factor	Withers Height (P value)	Rump Height (P value)	Body Length (P value)	Chest Girth (P value)	Front Wrist Girth (P value)	Rump Breadth (P value)	Chest Breadth (P value)	Chest Depth (P value)	Birth Weight (P value)
Maternal Age	0.286	0.390	0.341	0.034	0.880	0.553	0.224	0.512	0.074
Birth Year	0.500	0.388	0.113	0.478	0.100	0.994	0.066	0.540	0.965
Gender	0.217	0.120	0.256	0.045	0.000	0.622	0.992	0.620	0.004

In Table 3, the maternal age was assessed as a group of 4 years and under and a group of 5 years and over. According to the maternal age group, variance analysis was performed in terms of calf body measurements and birth weight parameters and for parameters where the difference between groups is important the significance level of differences was compared with Tukey multiple comparison test. As a result of analysis, it was determined

that chest girth, front wrist girth and birth weight of female calves changed according to the maternal age ( $p < 0.05$ ). Similarly it was determined that body length, chest girth and birth weight values of male calves were affected by maternal age ( $p < 0.05$ ). As a result of the evaluation, it was determined that Anatolian Black cattle aged 5 years and over gave birth to bigger calves in terms of birth weight and chest girth characteristics.

**Table 3.** Variance analysis of some body measurements according to maternal age groups

Gender	Maternal Age (year)	n	Withers Height (Cm)	Rump Height (Cm)	Body Length (Cm)	Chest Girth (Cm)	Front Wrist Girth (Cm)	Rump Breadth (Cm)	Chest Breadth (Cm)	Chest Depth (Cm)	Birth Weight (Kg)
Female	≤4	10	56.90±0.966	60.60±0.816	50.20±1.446	56.45±1.165 <sup>b</sup>	7.85±0.224 <sup>b</sup>	9.60±0.233	13.35±0.460	18.90±0.722	15.20±0.485 <sup>b</sup>
Female	≥5	15	58.27±0.832	62.07±0.932	53.27±1.329	61.27±1.041 <sup>a</sup>	8.40±0.121 <sup>a</sup>	9.53±0.124	13.83±0.319	20.37±0.703	18.60±0.744 <sup>a</sup>
<i>P</i>			0.300	0.280	0.141	0.006	0.028	0.786	0.381	0.174	0.002
Male	≤4	17	58.71±0.629	63.32±0.707	51.44±1.258 <sup>b</sup>	58.97±0.902 <sup>b</sup>	8.79±0.149	9.65±0.205	13.59±0.258	19.74±0.489	18.18±0.617 <sup>b</sup>
Male	≥5	16	60.56±1.057	65.13±1.133	56.03±1.659 <sup>a</sup>	63.50±1.029 <sup>a</sup>	9.11±0.131	10.09±0.104	14.31±0.302	20.72±0.516	21.71±0.912 <sup>a</sup>
<i>P</i>			0.136	0.182	0.034	0.002	0.127	0.066	0.077	0.176	0.003

<sup>a,b</sup>The relationship between the meanings shown in the same column with different letters is significant ( $p < 0.05$ )

#### 4. Conclusions

As a result of the evaluation, it is thought that Anatolian Black Cattle have reached the maturity after 5 years of age and therefore give birth to bigger calves after reaching the maturity. The reason why the effect of birth year was not found statistically significant ( $p > 0.05$ ) on all body measurements examined is thought to be due to the fact that animals are standardized in terms of maintenance and feeding conditions in the Institute.

#### Conflict of Interest

The authors declare that there is no conflict of interest.

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