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RELATIONSHIPS BETWEEN SOMATIC CELL COUNTS, TOTAL BACTERIA COUNTS AND UDDER MEASUREMENTS IN MILK OBTAINED FROM HOLSTEIN COWS

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Abstract: With an aim of evaluate the somatic cell counts (SCC) and Total bacteria counts (TBC) of milk samples, total 30 Holstein cows were selected. Milk samples were obtained from individual cows in the first 3 days of early lactation period. A significant negative correlation has been found between udder depth (UD) and SCC ($r = -0.301$; $p<0.05$). However, a significant positive correlation was found between teat length (TL) and SCC ($r = 0.549$; $p=0.002$). No significant relationships were found between UD, TL and TBC. According to regression analysis results, it is possible to say that SCC decreased by 3,083 cells/ml compared to 1 cm increase of UD. However, we observed that SCC increased by 25,103 cells/ml compared to 1 cm increase of TL. Dairy breeders who want to improve the quality of milk at an favorable level should consider these findings.

Keywords: Somatic Cell, Holstein Cows, Total bacteria counts.

Introduction

Somatic cell counts (SCC) and total bacteria counts (TBC) are important criteria for quality in milk (Haas et al., 2008). Both parameters are of great importance for dairy producers and the dairy industry (Egger-Danner et al., 2007). For this reason, the factors affecting these two parameters have become the focus of researchers in recent years (Urioste et al., 2010). Environmental and animal factors are two main factors affecting these two parameters (Van Dorp et al., 1999). Many studies on the effect of environmental and animal factors on these quality criteria are available in the literature (Sargeant et al., 1998; Neuenschwander, 2010). Although there are studies showing the effect of udder measurements on these parameters (Thomas et al., 1984; Monardes et al., 1985), research results are not satisfactory at the desired level. The relationship of these two important parameters affecting milk quality with animal factors should be clearly demonstrated. Udder measurements (UM) are widely used as selection criteria especially in milk yield (Petersen, 1984). Selection studies are also a focus

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on milk parameters, not only for milk yield. As studies progress in this direction, new information will be gained to increase milk quality. Although there are studies on the impact of environmental and animal factors on these quality parameters in the field, it is not clear which factor affects which parameter how many units. In this study, while determining the relationship of udder measurements with these parameters, it will also be revealed that how many units these measurements affect the parameter. It is an indisputable fact that when these units are obtained, there will be useful information in dairy cow selection studies.

Material and Methods

Animals: With an aim of evaluate the SCC and TBC of milk samples, total 30 Holstein cows were selected. Holstein cows were selected from a commercial dairy herd.

Udder measurements (UM): Udder measurements (cm) such as Udder Circumference (UC), Udder Depth (UD), Teat Circumference (TC), and Teat Length (TL) were made according to the method reported by White and Vinson (1975).

Milk samples and laboratory analysis: At least 100 ml of milk was obtained from individual cows in the first 3 days of early lactation period. The somatic cell count (cell/ml) within taken raw milk samples was detected by the standard analysis (Microscopic count) method and TBC (cell/ml) was determined by standard plate count in the laboratory.

Statistical analysis: With an aim of learning the parameter values of milk, descriptive statistics was used (Cimen, 2015). Besides, multiple linear regression and person correlation were used to research the relationships between parameters and udder measurements (Box et al., 2005). All statistical analyses on descriptive statistics and relationships between parameters were performed using the statistical software SPSS 25.0 for Windows.

Result and Discussion

Descriptive statistics about the parameters examined are shown in Table 1.

Table 1. Descriptive Statistics

	Mean	Std. Deviation	N
SCC (x10^3 cell/ml)	154,0	46,38853	30
TBC (x10^3 cell/ml)	134,7	55,25698	30
UC (cm)	124,4	13,57402	30
UD (cm)	37,1	5,33692	30
TC (cm)	5,8	,71539	30
TL (cm)	6,2	,90163	30

Correlations between udder measurements and parameters are shown in Table 2. As can be seen from the Table 2, a significant negative correlation has been found between UD and SCC (r = -0.301; p=0.038). According to Koeck et al. (2012) genetic correlations between SCC and UD were negative. This information is consistent with our study results. However, a significant positive correlation was found between TL and SCC (r =0.549; p=0.002). Genetic correlations between teat length and SCC tended to be positive (Rogers and Hargrove, 1991). Probability of injury or the likelihood of exposure to possible pathogens is one acceptable mechanism that contributes to these relationships (Rogers et al., 1989). No significant relationships were found between other udder measurements and the mentioned parameters. We can say that, in this research, obtained correlations between UD, TL and SCC are useful for future studies. UD and TL may be important selection criteria to depress SCC and thus to decrease mastitis in dairy cows.

Table 2. Correlations Between UM and Parameters

		SCC	TBC
UC	Pearson Correlation	-,424	,105
	Sig. (2-tailed)	,055	,582
UD	Pearson Correlation	-,301	,117
	Sig. (2-tailed)	,038	,538
TC	Pearson Correlation	-,091	,127
	Sig. (2-tailed)	,634	,504
TL	Pearson Correlation	,549**	,034
	Sig. (2-tailed)	,002	,859

It is possible to see at what level the relations between udder measurements and SCC occur in Table 3. As can be seen from the regression analysis table, it is possible to say that SCC decreased by 3,083 cells/ml compared to 1 cm increase of UD. However, we observed that SCC increased by 25,103 cells/ml compared to 1 cm increase of TL. As mentioned before, these results can be taken into consideration in selection studies.

Table 3. Determination of Relationship between UM and SCC on Unit Basis

Model		Unstandardized Coefficients		Standardized Coefficients	Collinearity Statistics			
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	119,876	89,799		1,335	,194		
	UC	-1,444	,492	-,423	-2,937	,057	,905	1,105
	UD	-3,083	1,293	,355	2,384	,045	,846	1,181
	TC	-9,433	9,436	-,145	-,1,000	,327	,885	1,130
	TL	25,103	7,126	3,523	,059	,002	,977	1,024

Dependent variable: SCC

The distribution graph (scatter plot) for SCC data is shown in Figure 1.

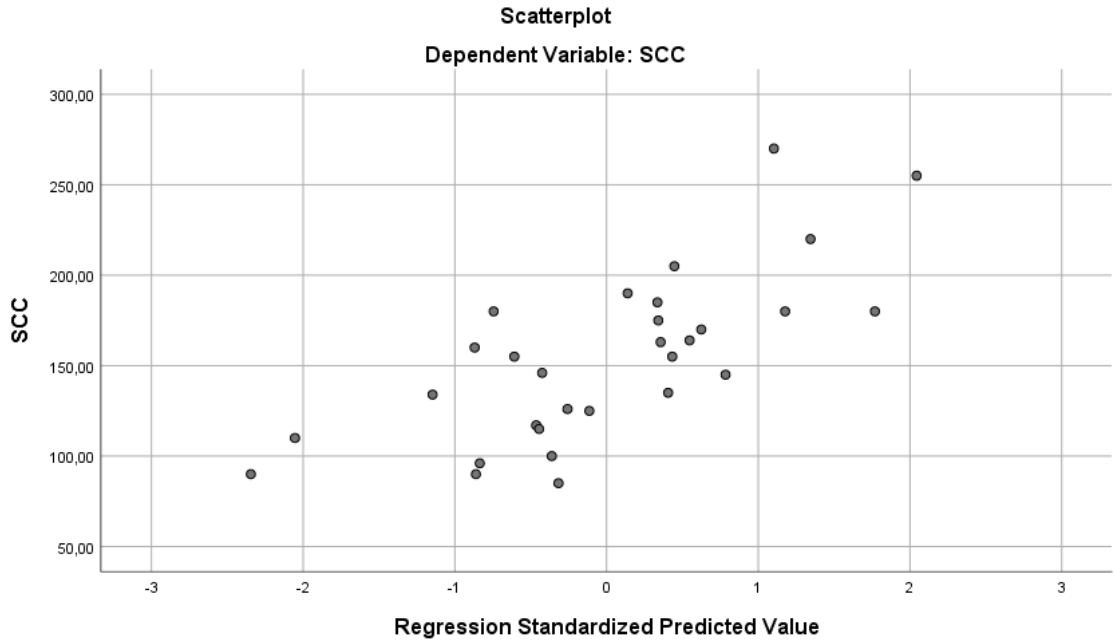

Fig.1. Distribution of SCC Data

As seen in Table 4, there were no significant relationships between udder measurements and TBC. Although the results found for TBC are useless in selection studies, this expression does not apply to SCC. However, the results found in the research are those found for Holstein cows. Therefore, new studies are needed on data to be obtained from other cow breeds.

Table 4. Determination of Relationship between UM and TBC on Unit Basis

Model		Unstandardized Coefficients		Standardized Coefficients	Collinearity Statistics			
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	11,844	154,006		,077	,939		
	UC	,322	,843	,079	,382	,705	,905	1,105
	UD	,681	2,218	,066	,307	,761	,846	1,181
	TC	7,092	16,182	,092	,438	,665	,885	1,130
	TL	2,679	12,220	,044	,219	,828	,977	1,024

Dependent variable: TBC

Valuable information was obtained from the research results. For milk producers and the dairy sector, the results found in mastitis prevention are of great importance. With this study, it was determined how many units increase or decrease in SCC when an increase of 1 cm occurs in udder size. Dairy breeders who want to improve the quality of milk and keep animal health at an optimum level should consider these findings. Our findings should be confirmed by future new researches.

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