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Statistical determination of effect of somatic cell count on dairy processing and flavor in romanov sheep milk

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Abstract

In this research, statistical control on somatic cell counts (SCC) of milk obtained from the Romanov sheep raised in Tunceli Province of Turkey performed for determination of suitability to dairy process and flavor standards. In the study, 10 Romanov sheep were used as animal material. The somatic cell count means were compared with the mentioned reference values for dairy process and flavor standards using one-sample t test. Milk SCC rate for used animal material (155.763cells/mL) was lower than reference value of standards for dairy process (max. 1.000.000cells/mL). Observed SCC levels for Romanov sheep were lower than announced limits for undesired taste (max. 3.000.000cells/mL). Found milk SCC in the research was so favorable for both standards. Higher values from dairy process standards could be an undesirable level for extremely sensitive consumers although it is suitable for undesired taste limit. Milk containing low SCC of Romanov ewes is more favorable in terms of flavor of milk and economic gain associated with dairy process.

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Introduction

The milk somatic cell counts are important parameters for the sheep farms for providing information about the success of farm. Mastitis which leads to passage of some substance and tissues from blood to udder and it results in an increase in the SCC and alteration in milk contents (Kitchen, 1981). Elevated SCC in milk are associated with lower milk components having economic importance such as fat and protein in terms of dairy process and flavor of products. The effect of SCC on dairy product yield is significant even if adjustments will be make for protein and total protein rate of milk. Therefore, dairy producers who want to maximize to their products should minimize factors related to SCC increase.

Statistical control studies associated with milk products have been increased in recent years (Onoglu *et al.*, 2013; Çimen, 2016). Statistical controls are important in terms of protection of productivity and product quality. In developed countries, research and development centers often refer to statistical controls for continuity of product quality. For this reason, the dairy sector should also focus on statistical control studies on factors affecting dairy products.

Flavor and odor defects can originate due to an accumulation of off-flavor resulting from the effect of high SCC levels. Unwanted alterations in organoleptic quality of raw milk can occur when unfavorable environmental changes and conditions caused by animals are take place (Le Marechal *et al.*, 2011). Studies on product processing and organoleptic properties of dairy products are important for the dairy sector. This research aims to determine the effect of SCC on the dairy processing and organoleptic properties of raw milk such as flavor.

Material and methods

Animal material and collection of data

In this research, statistical control on somatic cell counts (SCC) of milk obtained from the Romanov sheep raised in Tunceli Province of Turkey performed for determination of suitability to dairy process and flavor standards. In the study, 10 Romanov sheep were used as animal material.

Milk analysis

Raw milk samples (50ml) collected from third week of postpartum period were taken from each sheep for laboratory analysis and it was transferred for analysis in a short time. The milk somatic cell count was determined by the standard analysis (Microscopic count) method.

Statistical analysis

The statistical analyses (One sample t test) were applied to microbiological data (Norusis, 1993). The milk somatic cell count means obtained from Romanov sheep were compared with the standards (Tancin *et al.*, 2017) for dairy process (max. 1.000.000cells/mL) and maximum limit (Vivar-Quintana *et al.*, 2006) for undesired taste (3.000.000cells/mL) using one-sample t test. The findings from statistical analyzes are interpreted by comparison *with the standards*. Statistical results were obtained using *SPSS (version* 18) Statistics software (Çimen, 2015).

Results and discussion

The statistical analysis on somatic cell counts obtained from Romanov ewes are covered in subheadings.

Statistical control for dairy process

Table 1 gives mean and standard error for SCC in milk collected from Romanov ewes. Somatic cell count mean in the Romanov ewe was 155.763cell/mL (Table 1).

Table 1. The suitability test for dairy process *standards*.

	Mean	Std. Error Mean				
SCC	155.763	31.742				
	One Sample Test					
	Reference value = 1.000.000					
	t	df	P	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
SCC	-26,596	9	,000	-8,44	-916043	-772429

There were statistically differences between somatic cell count means and standard reference value of dairy process ($p<0.001$). The finding mean for SCC in Romanov sheep (155.763cell/mL) was lower than announced standard value for dairy process (max. 1.000.000cell/mL).

The observed somatic cell counts for Romanov sheep in this study have an advantage for making of dairy products such as cheese and yogurt. The results found from SCC in raw ewe milk suggest that mastitis is not present in the Romanov sheep, because sheep with clinical mastitis has a SCC more than 1.000.000cell/mL (Tancin *et al*., 2017). According to results obtained from Romanov ewes, it can be said that, the sheep farm is very successful in terms of mentioned critical limits for dairy process and mastitis control.

Statistical control for undesired flavor

As shown the Table 2, there were statistically differences between somatic cell count mean of Romanov sheep and critical reference value for bad taste ($p<0.001$). The SCC mean in Romanov ewes (155.763cell/mL) was lower than reference limit threshold for undesired flavor (max. 3.000.000cell/mL). SCC means obtained from sheep were compatible with critical thresholds. Therefore, we cannot say that somatic cell levels in *Romanov ewes are worse than the above mentioned standards.* The observed results from Table 2 show that the performance associated with standards of dairy farm is enough in terms of announced critical thresholds. Serious taste and odor defects can appear due to an accumulation of off-flavor resulting from the effect of high somatic cell counts. Undesirable changes in organoleptic quality of milk are possible when negative environmental changes and conditions caused by animals are occur (Le Marechal *et al*., 2011). Whereas, in this study, proximity to negative threshold for undesired taste of raw milk obtained from Romanov sheep was not identified. Higher somatic cell levels from dairy process standards could be an unfavorable threshold for extremely sensitive consumers although it is compatible with unwanted flavor limit.

Table 2. The suitability test for undesired taste.

	Mean	Std. Error Mean
SCC	155.763	31.742

One Sample Test

Reference value = 3.000.000

	t	df	P	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
SCC	-89,603	9	,000	-2,84	-291606	-277246

Many reports have described the changes in dairy product output in terms of mastitis associated with high somatic cell counts. Regarding quality control, the high SCC in raw milk is the main indicator for the detection of mastitis (Viguier *et al.,* 2009). Numerous studies have reported on the impact of SCC related to dairy processing (Merin *et al*., 2008). However, the studies on which the statistical controls associated with somatic cell count are made are not available in the literature. The current study will be a pioneering research in closing the shortcomings associated with statistical controls.

Conclusion

In the study, observed milk SCC mean in Romanov ewes was lower than mentioned reference limit thresholds for undesired flavor and dairy process. Milk containing low SCC of Romanov ewes is more suitable in terms of flavor of milk and economic gain associated with dairy process. The somatic cell counts in raw sheep milk may be more useful indicator for determining of standards associated with dairy process and test of undesired taste in raw milk. However, it must be known that it is not reliable that SCC is the only criterion for detection of announced characteristics in raw milk.

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