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DETERMINATON OF CONFORMITY ACCORDING TO EUROPEAN UNION STANDARDS OF TOTAL BACTERIA COUNTS IN MILK OBTAINED FROM HOLSTEIN COWS MILKED BY MACHINE DURING DIFFERENT LACTATION PERIODS

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Abstract: This research was aimed to investigate the suitable to Europe Union (EU) standards of total bacteria counts in milk obtained from Holstein cows and milked by machine. Total bacteria counts (TBC) of milk samples were compared with the EU standards (max. 100.000 per mL) using one-sample t test. The found total bacteria counts for early lactation (107.000 per mL) and mid lactation period (132.000 per mL) of announced dairy cows milked by machine were statistically favorable for EU standards. Whereas, total bacterial counts (165.000 per mL) obtained from late lactation period were not found to comply with announced standards. The findings from Holstein cows milked by machine show the variability of TBC for different lactation periods. Further studies are needed to determination of suitability to EU standards of milk obtained from machine milking for different dairy cow breeds. Holstein breed milked by machine for Turkish producers can be relatively advantageous for the milk hygiene and production of good quality dairy products during early and mid lactation period.

Keywords: Milk, total bacteria, EU standard, Cow.

INTRODUCTION

Hand milking is more time-consuming and the work required is harder and less economic. Hygienic conditions in hand milking are more difficult than that of machine milking and machine milking is more advantageous in terms of hygiene than hand milking (Hui, 1993). The animal and environmental factors such as race, body condition, milking systems which affect milk yield in dairy cows have effect on milk constituents (Bruckmaier, 2001; Yildirim et al. 2008; Yildirim, 2009). It was reported that milk components were affected by milking methods in different dairy cow breeds because they have different autocrine control of milk secretion (Tancin and Bruckmaier, 2001; Thomas, 2004). The cisternal milk can be easily obtained by suckling, hand, or machine milking without any previous stimulation. However, the alveolar milk can only be completely obtained if milk ejection occurs by suckling (Bruckmaier and Blum, 1998). The distribution of milk between cisternal and alveolar

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compartment will influence the component of milk in different species and breeds. Lack of hygiene can result in contamination of the milk obtained from dairy cows. Since hygiene is most common risk factor for dairy products, the risk factors can be eliminated or substantially reduced in number if we can identify the risk factors and modify them accordingly. The negative parameters such as TBC in milk are proving to be a major risk factor in the development of bad taste and undesirable dairy products, a risk factor that can definitely be modified. If the TBC exceeds 100.000 cfu/ml, it is considered unhealthy for consumers and this level is not suitable for production of dairy milk products (Robinson, 2002). Researchers on milk quality focused on hygiene parameters such as total bacteria counts associated with quality properties in cows milked by machine (Reinemann, 1996). Statistical control studies are noteworthy in terms of perpetuity of productivity and dairy product quality. In developed countries, dairy sector often refer to statistical controls for permanency of dairy product quality. For this reason, the milk producers and dairy sector should also focus on statistical control researches on factors affecting milk products. The researches on the quality standards of milk from machine milking are sparse in literature. Failure to work on the conformity of our milk production to the European Union for our country, which is a candidate for the European Union, is a major shortcoming in the field. This is the first study on the suitability to EU quality standards associated with hygiene of milk obtained from Holstein cows milked by machine during different lactation periods in Turkey.

MATERIALS AND METHODS

In the research, the milk samples were obtained from 30 Holstein cows and milked by machine. Milk samples for once were obtained from first month of early, mid and late lactation periods. The daily milk samples were collected into sterile bottles and stored 4ºC until analyzing for determination of TBC within 24 h of sampling. TBC was measured using Plate Count Agar (PCA). The TBC of raw milk was compared with the reference value (max. 100.000 per mL) of EU standard (Anonymous, 2004) using one-sample t test (Çimen, 2015; Ntoumanis, 2005) by SPSS 18.0 package program.

RESULTS AND DISCUSSIONS

The values for TBC mean, standard deviation, standard error, degree of freedom, p and t values, and mean differences can be seen in Table 1 for early lactation period. The TBC of milk samples obtained from Holstein cows by machine milked was compared with the EU standards using one-sample t test.

Table 1. The Suitability of TBC in Milk to EU standards for Early Lactation Period

	Mean	Std. Deviation	Std. Error Mean
TBC	107.000	35.292	11.160

One-Sample Test

Test Value = 100.000

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
TBC	.627	29	,546	7.000	-18,246	32,247

As is shown in the Table 1, no severe shortcoming which is associated with milk hygiene problem was observed in Holstein cattle milked by machine in early lactation period. High TBC indicates a severe hygiene problem, whereas in our study, the milk TBC for this period was not high for announced Europe Union standard. In dairy cows, milk production is high the early lactation and then decreases with advancing lactation. According to (Botton et al. 2019) there are negative correlation between milk production and total bacteria count. Elevated milk yield in this period may reason on low TBC. Milk having low TBC has advantage for production of dairy products according to desirable standards during this critical period.

Table 2. The Suitability of TBC in Milk to EU standards for Mid Lactation Period

	Mean	Std. Deviation	Std. Error Mean
TBC	132.000	47.562	15.040

One-Sample Test

Test Value = 100.000

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
TBC	2.128	29	,062	32.000	-2,024	66,024

According to statistical control results in Table 2, total bacteria count for mid lactation period was consistent with announced standard. Based on the results, the mid lactation period

conditions was not a problem in terms of milk hygiene. The high standard errors of the means of total bacteria counts show that there is no uniform production in terms of hygiene. The high standard error of mean is due to individual hygienic differences between animals. Higher numerical mean value (132.000) than EU reference value (100.000) was not differ statistically than the announced value due to their high standard error.

Table 3. The Suitability of TBC in Milk to EU standards for Late Lactation Period

	Mean	Std. Deviation	Std. Error Mean
TBC	165.000	66.708	21.095

One-Sample Test

Test Value = 100.000

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
TBC	3.081	29	,013	65.000	17,279	112,720

The statistical results in Table 3 were found to be different from Table 1 and 2. According to the data of Table 3, undesirable findings are observed in late lactation period results. Total bacteria count obtained from late lactation period was not found to comply with EU standard. Milk producers should be more careful in terms of milk hygiene during this period. Invariably milk becomes contaminated during milking. However, contamination by machine milking is less than manual milking (Robinson, 2002). It is necessary to know all factors affecting the milking hygiene. According to (Botton et al. 2019) there are negative correlation between milk production and total bacteria counts. Dairy cows in the late lactation stage have lower total milk yield than that of other periods (Vijayakumar et al. 2017). Based on information, high total bacteria count during late lactation period can be attributed to low milk yield. However it is not enough and reasonable to say that low milk yield is the only reason for high bacteria counts. According to (Kayatsha et al. 2008), environmental conditions and climate changes have influences on milk hygiene. Therefore, the environmental factors affecting milk hygiene should be closely monitored during this period. The results for TBC in this study may be an important indicator to dairy manufacturers raising Holstein cows by machine milked.

TBC values of milk for all periods in this paper are compatible with normal values (max. 300.000 per mL) for dairy cattle announced by (Koneko and Cornelius, 1980).

CONCLUSION

In this study, changes in TBC are investigated during lactation periods in machine milking application for Holstein cattle breed. A constant total bacteria level could not be achieved for all lactation periods at machine milking treatment. According to findings from our study, we can say that TBC in milk obtained from machine milking varies according to lactation periods. TBC values of early and mid lactation milk in this study are compatible with reference values of EU standard. However, total bacteria count obtained from late lactation period was not found to comply with EU standard. Further researches are needed to determination of suitability to EU standards of milk obtained from different cattle breed such as Simmental, Brown Swiss, Jersey etc. raised in Turkey. This study should be repeated for all cattle breed by machine milked and raised in our country. Confirming the findings from this study with similar studies on different cow breeds will be useful. According to findings obtained from this study, preferring the milk obtained from early and mid lactation period for Holstein breed by machine milked can be relatively advantageous for the milk hygiene and production of good quality dairy products.

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