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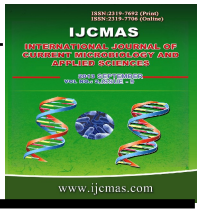


Original Research Article

Somatic cell count of bovine bucket milk: a study from Turkey

Ayse Keskin and Savas Atasever*

Department of Animal Science, Faculty of Agriculture, University of Ondokuz, Mayis, 55139- Samsun, Turkey
**Corresponding author e-mail: satasev@omu.edu.tr*

A B S T R A C T

This study was conducted to determine the effects of some factors on somatic cell count (SCC) in bucket milk samples in Samsun province, Turkey. Raw milk samples and questionnaires collected from three different selling points between April 2011 and January 2012 were used as the investigation materials. The SCC values were determined by direct microscopic method and the data were transformed to log10 base to obtain homogeneity. One-way ANOVA was used to detect the changes in SCC by herd size (HS), location of bazaar (LB), location of farm (LF) and education level of dairy owner (EL). Also, changes in SCC by season (S) were evaluated using Kruskal Wallis test for variance analysis and Mann-Whitney U test was used for detection of group differences. While no significant differences were found in logSCC means by EL and HS groups, in S evaluation, logSCC means of summer and autums groups were higher ($P<0.001$) than those evaluated in the other S groups. Besides, effect of LB on logSCC was statistically significant ($P<0.05$). Finally, the present study clearly shows that unpacked cow milk samples sold in Samsun province include marked risks by SCC and this negatively case should be removed applying more focus on storage and marketing conditions.

Keywords

Somatic cell count; Milk quality; dairy; unpacked milk.

Introduction

According to recent data, 92% of total raw milk has been obtained from cows in Turkey. This case clearly indicates that cattle's breeding has an important portion in milk production of the country. However, relatively high amount of small scale farms in the total dairy enterprises, unhygienic conditions of the barns and failure in the milk cold chain can be remarked as the main issues of Turkey's dairy sector. Such as, only 20% of total raw milk is processed in the modern factories. Also, some study results (Celik *et al.*, 2005; Kaya and Filazi, 2010) point out to high antibiotic residuals and microorganisms in unpacked raw milks.

As a general term, milk including low bacteria and somatic cell count (SCC), and milk with no abnormal taste or scent can be classified as quality. To achieve this goal, quality standarts have been revealed

in many countries. Of these, SCC, which reflects especially leucocytes level of milk, is assumed as a reliable parameter and the limit of SCC for human consumption is $400x10^3$ cells/ml in EU countries. Moreover, marked milk production losses can be observed in dairy herds due to elevated SCC (Erdem *et al.*, 2010). In spite of some limited studies have been conducted on the determination of SCC in Turkey (Atasever, 2012; Atasever and Erdem, 2013, these investigations especially focuse udder quarter base. In this point, there is no detailed research intensifed the factors affecting SCC of unpacked bucket milks sold in the open bazaars. This will also help to public health by revealing common risk factors for cow milk.

The objective of this study was to investigate some factors effective on SCC of bovine milk sold as unpacked conditions in Samsun province, Turkey.

Materials and Methods

In the study, raw milk samples were collected from 3 different raw milk selling points (Istasyon, Modern and Atakum) in Samsun province, Turkey. Milk samples (~30 ml) were taken from small scale farm owners, who had similar husbandrial conditions by animal breed, hygienic status and structure of barn and feding management, in 4 seasons between April 2011 and January 2012. No preservative material including samples were immediately reached to laboratory for SCC analysis in the same days. SCC analysis was performed by direct microscopy according to IDF (International Dairy Federation) standarts (Packard et al., 1992). Besides, considered effective factors on SCC were recorded from whole milk sellers via questionnaires. Investigated factors were: education level of farm owner (EL), herd size (HS) and location of farm (LF). Also, changes of SCC were evaluated by 4 seasons (spring, summer, autumn and winter).

For statistical analysis, SCC values were transformed to log10 base due to obtain homogenity of variance among data. All statistical analyses were performed using SPSS 17 (SPSS, 2010) at 0.05 level. While effect of selling point (SP), EL, HS anf LF on SCC were tested by one-way Anova, group means were compared with Tukey test. The following linear model was used:

$$y_{ijklm} = \mu + a_i + b_j + c_k + d_l + e_{ijklm}$$

where; y_{ijklm} = observation value for SCC, μ= mean of population, a_i= effect of farm locations (j= 1,2,3,4), b_j= effect of selling points (i= 1,2,3), c_k= effect of herd size (k= 1,2,3), d_l = effect of education level of farm owner (l= 1,2,3), e_{ijklm} = residual error.

Due to SCC data for seasons were not homogen, Kruskal-Wallis test was used for variance analysis, and Mann-Whitney U test was applied for determining the differences among logSCC means of season groups.

Results and Discussion

In the present study, logSCC values by LF are given in Table 1. As seen from the table, Tekkekoy and Ondokuz Mayis towns have important role on the unpacked milk production in Samsun according to sample number. However, no significant difference was obtained by LF in the study. This finding can be stated by similar climatic and geographic conditions

and also management applications of the farms. Such that, earlier results of Atasever *et al.* (2011) in the same region are harmonic with these findings.

As seen from Table 1, 1st and 2nd SP gropus were different from each other ($P<0.05$). This case indicates that unpacked cow milk selling points were different milk storage conditions. Actually, bazaar structures were not similar in the province. First of all, Istasyon had closed form with a gable shed and this structure might cause to a speed denaturation of raw milk in this center. Besides, due to investigated raw milk samples belong to various villages and towns, logSCC means or quality degrees of milks might change by SP.

In spite of farms with 10≤ cows had relatively higher logSCC mean, no significant difference was observed in the HS groups (Table 1). Also, farms with 5-9 head had an important portion of the work material in this study. Obtained results in this section were not agreement with some study findings (Skrzpek *et al.,* 2004; Ingham *et al.,* 2011). Theorically, elevated SCC is an expected case in farms with higher animal population due to required labor for management. Similarly, it can be expected reduced SCC in farms with relatively less animal population due to focuse facility with more workers. However, because of animal numbers were nearby to each other in this study (mean= 7.545 head), no statistically significant was determined among the HS groups.

In EL evaluation, mean of 3rd group (first school) was higher than the others, but no significant differenve was found among the EL groups. The fact that advanced education level could be affected milk quality (SCC) positively. Some earlier study results (Bell *et al.,* 2005; Yamane, 2006 and Nagahata *et al.,* 2007) supported this opinion. Nonwithstanding, no farmer with secondary school or high education was investigated in the study and thus, similar thresholds of farm owners might played role on this finding. Also, these results were paralel with the findings of Yalçin *et al.,* (2010).

According to Kruskal-Wallis test results, difference among logSCC values of unpacked milk samples were statistically significant ($P<0.05$). Distrubution graphic is given in Figure 1. As seen that logSCC means of winter and spring were lower than means of summer and autumn means. In this case, high temperature and humidity migh played an important role. Actually, high SCC in the summer season was related to physiologic stress by Norman *et al.* (2000). Besides, Przysucha and Grodzki (2004) emphasized that lack performance on hygienic practices could be main reason of elevated SCC in hot seasons. Also, Barkema *et al.* (1997) reported that cell nucleuses can easily degenere in these periods. Obtained findings in this section were also in agreement with the results of Atasever and Erdem (2008, 2010), who calculated relatively higher SCC in the summer and autumn seasons in the same region.

In the view of the obtained findings of the present study, unpacked cow milk samples sold in Samsun province include marked risks by SCC. Also, SCC is tended to elevatete in the summer and autumn seasons due to climatic conditions. These negatively cases should be removed applying more focus on storage and marketing conditions in the marketing areas of the region.

Table.1 Factors affecting SCC in unpacked milk

Factor	1	2	3	4
LF*	5.98±0.31 (61)	5.97±0.33 (50)	5.94±0.26 (25)	5.93±0.31 (64)
SP**	6.04±0.33[a] (72)	5.89±0.27[b] (76)	5.94±0.31[ab] (52)	
HS***	5.96±0.37 (67)	5.98±0.29 (80)	5.92±0.26 (53)	
EL****	5.91±0.33 (45)	5.92±0.29 (26)	5.98±0.31 (129)	

Different superscript letters in the same column indicate significant differences ($P<0.05$)
The numbers in pharantheses show sample sizes (n)

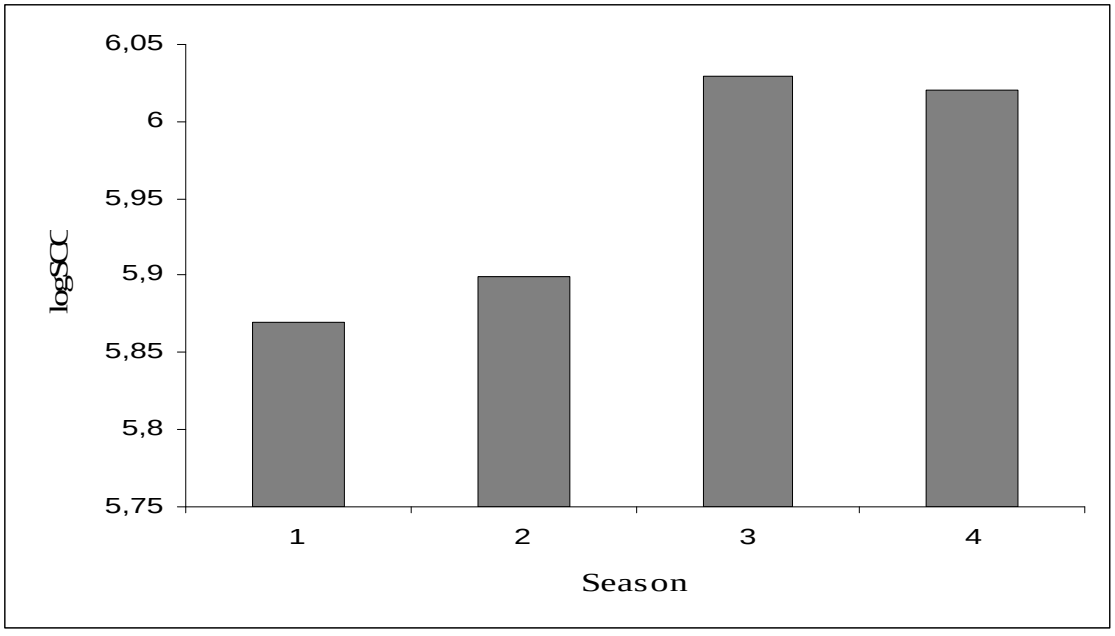
LF*: Location of farm **(**1: Tekkeköy, 2: Carşamba, 3: Samsun (center), 4: Ondokuz Mayis)

SP**: Selling point (1: Istasyon, 2: Modern, 3: Atakum)

HS***: Herd size (1: 1-4 head, 2: 5-9 head, 3: ≥10 head)

EL****: Education level of farm owner (1: non-literate, 2: literate, 3: first school)

Figure.1 Seasonal change of logSCC in unpacked cow milk samples
(Seasons = 1: winter, 2: spring, 3: summer, 4: autumn)



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