



## Effect of summer season on quality of raw milk used for cheese production

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### Abstract

In this study, statistical control on milk fat and protein rates of raw milk obtained from the summer months performed for determination of suitability to quality cheese production standards. The protein and fat rates was compared with the announced standards of raw milk used in quality cheese making using one-sample t test. Raw milk fat rates for summer season (3.46, 3.68, 3.44% for June, July and August, *respectively*) were compatible with reference values of quality cheese making process standards from raw milk (fat, min. 3.2%). Similarly, protein rates (3.32, 3.34, 3.33% for June, July and August, *respectively*) were suitable for desirable quality (protein, min. 3.3%) in cheese making. According the findings in our study, fat rates of raw milk in all summer months were favorable for quality cheese production. Similar to fat results, protein rates were suitable for desirable quality in cheese making. Milk containing high fat and protein is more favorable in terms of flavor of cheese and economic gain of producers.

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## Introduction

The quality of milk used for cheese production is very important for many typical products. The raw milk components are affected by animal (Yıldırım *et al.*, 2009) and environmental factor, such as milking methods (Cetin *et al.*, 2007), season (Ceylan *et al.*, 2013) and lactation (Cetin *et al.*, 2010). Milk origin is particularly important when there is the possibility to link a product to a breed, to a region, and to a production system. Breed is the main genetic aspect affecting milk quality characteristics and, consequently, cheese-making technology and quality of products. Differences in level of production and chemical and technological properties of milk have been widely demonstrated among dairy cattle breeds (Auldust *et al.*, 2002, 2004). It is as effective as animal breed on milk composition in environmental changes. Therefore, these effects must be known in all aspects.

Fat and protein rates in milk generally change in parallel, but fat is more affected by seasonal and feeding changes according to protein. Seasonal variation in milk composition is so important to cheese yield efficiency and composition control (Murphy *et al.*, 2016). However, there was no knowledge suitability to quality standards of main parameters such as fat and protein in raw milk collected from different season for quality cheese production. Only few studies have investigated the effect of season on quality of cheese.

Studies associated with statistical control of milk parameters have been increased in recent years (Onoğlu *et al.*, 2013; Çimen, 2016). Statistical controls on raw food material are important in terms of 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 of raw material affecting dairy products. The main objective of our study is to statistically determine the influence of the hot season on the main milk quality parameters such as fat and protein for quality cheese making.

## Material and method

### Collection of data

Daily milk data was collected from a milk company during all months of summer season. In the research, the milk samples were obtained daily for each month of summer season.

### Milk analysis

Hand milking was performed to plastic vessels. Fresh milk samples were analyzed for crude protein and fat using the milk auto analyzer (Milkana). Approximately 50ml milk sample was taken for analysis and it was transferred to the laboratory.

### Statistical analysis

The data were presented as mean  $\pm$  standard deviation (Çimen, 2015). The component means of raw cow milk were compared with the mentioned standard values for quality cheese production (fat min. 3.2%, total protein min. 3.3%) using one-sample t test. Comparisons were done with help of the SPSS (Norusis, 1993).

## Results and discussion

The findings of the research are given in two main headings and discussed as below.

### Differences between months

There were no significant differences in milk fat and protein values between summer months (Table 1). Milk fat and protein rates in June, July and August were 3.46 and 3.32; 3.68 and 3.34; 3.44 and 3.33%, respectively (Table 1).

**Table 1.** Statistically differences between summer months.

Parameters	June	July	August
Fat, %	3,46 $\pm$ 0,04	3,68 $\pm$ 0,28	3,44 $\pm$ 0,18
Protein, %	3,32 $\pm$ 0,28	3,34 $\pm$ 0,12	3,33 $\pm$ 0,48

Milk parameters can change according to the months of different season and lactation period (Karakoç, 2013; Turan *et al.*, 2014; Yılmaz *et al.*, 2017). The season affects the richness of contents in milk collected from dairy cows. The richest milk may be produced at some time when feeding is optimum.

Feeding regimes and seasonal temperature differences are the main cause of the differences in milk components obtained from different seasons. In our study, the nutrition and temperature differences between the summer months were limited and therefore the parameters were found to be similar.

*The determination of suitability of parameters to standards*

The statistical analysis of milk biochemical parameters for all months of summer season are presented in Table 2.

As shown the Table 2, the study season had a significant effect on total fat percentage in the milk. The analysis using one sample t-test revealed significant differences between milk fat levels in summer season and the standards for fat but not for protein values. The obtained fat rate from raw milk was found to be higher than the suggested standard, as shown in Table 2. The comparison of the mean values for the investigated milk components shows that there are not negative differences between standard values for quality cheese making and observed fat values. The fat values found in our study are lower than the normal values reported for cows (3.9%). But these low fat values obtained from study are not low for quality cheese making. According to Jenness (1985), the higher environmental temperatures during the summer also negatively affect milk fat composition. Fat depression may occur in the milk during summer season (Cimen *et al.*, 2013; Eryılmaz *et al.*, 2013). The milk fat depression is caused by improper feeding and environmental factors that depress fat production. The hot season in which our research was conducted may have been effective in the formation of fat depression.

There were no negative differences between standard values and observed values in milk fat and protein rates during all months. There were no differences in total milk protein rates between summer months as it was in the fat findings. According to these results, milk fat rates in summer months were favorable for quality cheese production. Similar to fat results, protein rates were suitable for desirable quality in cheese making.

**Table 2.** The statistical control of parameters for cheese making standards.

Standard values of quality milk for cheese making (Anonymous, 2009)	June	July	August
Fat (min.), 3.2%	3,46± 0,04 **	3,68± 0,28 *	3,44± 0,18 **
Protein (min.), 3.3%	3,32± 0,28	3,34± 0,12	3,33± 0,48

\*\* p<0.01, \* P<0.05

**Conclusion**

According the results from study, fat rates of raw milk in all summer months were favorable for quality cheese production. Similar to fat rates, protein levels were suitable for desirable quality in cheese making. Acquiring knowledge associated with economic components to increase production of milk with maximum rates of milk fat and protein is fundamental for obtaining the economic gain in cheese production. Therefore, further studies are needed to improve the interpretations about milk constituents such as fat and protein associated with pecuniary gain in dairy products. Content of cited milk fat and protein rates, point out that summer season is not unfavorable for the quality cheese production.

**References**

**Anonymous.** 2009. Raw milk quality. The principal milk components for cheese production **519**, 824-4120. University of Guelph. Guelph, Ontario, N1G 2W1, Canada.

**Auldish M, Mullins C, O'Brien B, O'Kennedy BT, Guinee T.** 2002. Effect of cow breed on milk coagulation properties. *Milchwissenschaft* **5**, 140-143.

**Auldish MJ, Johnston KA, White NJ, Fitzsimons WP, Boland MJ.** 2004. A comparison of the composition, coagulation characteristics and cheese making capacity of milk from Friesian and Jersey dairy cows. *Journal of Dairy Research* **71**, 51-57.

**Cetin M, Cimen M, Dilmac M, Ozgoz E, Karaalp M.** 2007. Studies of biochemical parameters of milk of sheep milked by machine early lactation period. *Asian Journal of Chemistry* **19(3)**, 2135-2140.

**Cetin M, Cimen M, Goksoy EO, Kirkan S, Yildirim S.** 2010. Machine milked and suckled goats differ in some biochemical components of their milk in 1st and 2nd weeks of lactation. *International Journal of Agriculture and Biology* **12(5)**, 799-800.

**Ceylan B, Çimen M, Bakır K, Oduncu İ.** 2013. Farklı mevsimlerden elde edilen inek sütlerinde pH seviyelerinin peynir standartlarına uygunluklarının belirlenmesi. *Bilim ve Gençlik Dergisi* **1(1)**, 7-12.

**Cimen M, Yildirim S, Cetin M, Tekelioglu O.** 2013. Determination of fat depression in milk from mechanical milking in winter and summer season. *Indian Journal of Animal Research* **47(5)**, 453-455.

**Çimen M.** 2015. Fen ve Sağlık Bilimleri Alanlarında Spssuygulamalı Veri Analizi. Palme Yayıncılık, Yayın No: 905, ISBN: 978-605-355-366-3. Sıhhiye, Ankara.

**Eryılmaz H, Çimen M, Eryılmaz M, Özer A, Karataş S.** 2013. Tunceli ilinde yaz mevsiminde elde edilen inek sütlerinde yağ depresyonunun belirlenmesi. *Bilim ve Gençlik Dergisi* **1(1)**, 39-46.

**Jenness R.** 1985. Biochemical and nutritional aspects of milk and colostrum. Ch. 5 in *Lactation*, B. L. Larson, editor. Ed. Ames: Iowa State University Press.

**Karakoç D, Çimen M, Demir N, Şos C, Gökkyer H, Ablak E, Kutlu C.** 2013. Ağustos ve Kasım aylarında batman ilinden elde edilen sütlerde ekonomik öneme sahip biyokimyasal parametreler. *Bilim ve Gençlik Dergisi* **1(1)**, 19-23.

**Murphy SC, Martin NH, Barbano DM, Wiedmann M.** 2016. Influence of raw milk quality on processed dairy products: How do raw milk quality test results relate to product quality and yield? *Journal of Dairy Science* **99(12)**, 10128-10149.

**Norusis MJ.** 1993. SPSS for Windows: Base System User's Guide. SPSS, Chicago, USA.

**Turan Z, Çimen M, Demir Z, Demir B, Coşkun B, Yildirim H.** 2014. Adıyaman ilinden şubat ve ekim ayında elde edilen inek sütlerinde asitlik değerlerinin karşılaştırılması. *İstanbul Aydın Üniversitesi Dergisi* **22**, 15-18.

**Yildirim S, Cimen M, Cetin M, Dilmac M.** 2009. The effect of live weight and age of dam on milk biochemistry of machine milked cows. *Australian Journal of Basic and Applied Sciences* **3(2)**, 477-479.

**Yılmaz Y, Çimen M, Şahin A.** 2017. Milk total fat and ph curves of Simmental cows in early and late lactation period. *The International Journal of Engineering and Science* **6(6)**, 94-96.