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# Suitability of protein/fat ratio of conventional raw milk from Autumn Season to production of different cheese types

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**Abstract**

This study was performed to research the suitable of protein/fat (P/F) rate in milk collected from autumn season to various cheese making. The P/F level for autumn season was compared with the different cheese reference values. The P/F ratio of milk collected from this period was suitable for Limburger cheese making. Whereas, P/F levels in this research were not acceptable for standards of Cheddar and Mozzarella cheese types. According to research findings, Limburger cheese can be made for autumn season, unfortunately Cheddar and Mozzarella cheese is not suitable for this period. The findings show the importance of P/F rate in conventional milk obtained from different seasons to quality production for suitable cheese varieties.

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## Introduction

Recently, there has been increasing interest on milk parameters having economic importance such as fat and protein (Cant *et al.,* 1993; Comino *et al.,* 2015; Ma *et al.,* 2014). Milk protein and fat has economic value because higher total protein and total fat rates leads to higher cheese yield (Cicek, 2007). These components are therefore called economic parameters. These parameters impact product development and quality of dairy products such as cheese.

It is necessary to standardization of conventional raw milk on a fat basis or on a protein-to-fat ratio (P/F) basis for desirable cheese composition and quality (Guinee *et al.,* 2007). The P/F rate in conventional milks is due to proportions of fat and protein (Bruhn and Franke, 1991) as affected by a lot of factors such as lactation stage and feeding practices and environmental conditions. It is known that seasonal factors affect milk quality. However, it is not known which type of cheese is suitable according to seasonal changes.

The variations of P/F rates in raw cow milk from different environment and animal material can offer different opportunities for the made of cheese varieties (Guine and Callaghan, 2013). Milk fat and protein content significantly affected firmness and flavor of dairy products such as cheese (Rayan *et al.,* 1980). It must be known that which raw cow milk should be preferred according to P/F for the producing of cheese varieties. The goal of this paper is to investigate the suitability of conventional cow milk from autumn season according to P/F level for the production of different cheese varieties.

## Material and methods

*Season and study area*

In the research, the daily conventional milk samples were obtained during October month of autumn season from Kırklareli Province.

*Milk analysis*

The daily milk samples were put into bottles and stored 4°C for analyzing procedure. The collected samples were analyzed by automatic milk analyzer device (Milkana).

*Statistical analysis*

The P/F level of conventional milk were compared with the standard P/F rates (Anonymous, 2009) of Cheddar (0.91), Limburger (0.88) and Mozzarella (1.22) by using one-sample statistical t test (Çimen, 2015) by SPSS 18.0 package program (Ntoumanis, 2005).

## Results and discussion

The mean and *standard deviation* for the P/F ratio of conventional milk obtained from autumn season were given in Table 1.

**Table 1.** Descriptive statistics for P/F Rate from Autumn Season.

| Mean | Std. Deviation |
|---|---|
| 0,87 | 0,19 |

*Suitability for Cheddar Cheese Standards*

The P/F ratio of conventional milk from autumn season was compared with the Cheddar cheese standards in Table 2. The P/F rates (0.87) for autumn season were statistically lower ($p<0.05$) for reference value (0.91) of Cheddar Cheese. According to research findings, Cheddar cheese cannot be produce from conventional milk from autumn season. If Cheddar cheese making is desired, arrangements should be made to increase the P/F ratios. However, the purpose of this study is to determine what cheese type is suitable for non-standardized raw milk samples obtained from autumn season.

**Table 2.** Statistical analysis for Cheddar Cheese production.

| | Test Value = 0.91 | | | | | |
|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| P/F Ratio | -,514 | 89 | ,047 | -,014 | -,05 | ,03 |

*Suitability for Limburger Cheese Standards*

P/F ratio (0.87) of autumn milk was compatible with the standards (0.88) reported for Limburger cheese (Table 3). According to these findings, it is possible that Limburger cheese can be produce from autumn milk.

There is no need to standardization of the raw milk for this type cheese the milk samples having enough P/F ratios for this season is very suitable for Limburger cheese standards during this season.

**Table 3.** Statistical analysis for Limburger Cheese production.

| | Test Value = 0.88 | | | | | |
|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| P/F Ratio | ,85 | 89 | ,411 | ,018 | -,02 | ,05 |

*Suitability for Mozzarella Cheese Standards*

The P/F rates (0.87) for autumn season were statistically lower ($p<0.001$) for reference value (1.22) of Mozzarella Cheese. P/F rate of autumn milk was not suitable for the desirable P/F standards of Mozzarella cheese (Table 4). According to findings from the Table 4, Mozzarella cheese cannot be made in this season. The effect of season on milk fat and protein rates could be attributed to changes in either temperature or photoperiod. The duration of the photoperiod or temperature is most likely affect milk fat and protein production for different seasons (Barash *et al.*, 1995).

**Table 4.** Suitability for Mozzarella Cheese.

| | Test Value = 1.22 | | | | | |
|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| P/F Ratio | -18,66 | 89 | ,000 | -,33 | -,37 | -,22 |

According to findings from the research, it can be said that autumn milk samples were suitable for reference values of Limburger cheese. Whereas, P/F rate of samples was not suitable for the production of Cheddar and Mozzarella cheese. Because of the p/f ratio required for Cheddar and Mozzarella cheese making is high, our samples is not suitable for these cheese types. The p/f ratio required for Limburger cheese making is low. Therefore the low P/F rates of milk samples in our study are favorable for Limburger cheese production.

**Conclusion**

To sum up, Limburger cheese can be produce from conventional milk obtained from autumn season. Because Cheddar and Mozzarella cheeses requires high P/F rate, unfortunately these cheese types are not suitable for this period. Protein ratios in autumn season should be increased for Mozzarella and Cheddar cheese making. However, it was aimed to determine what cheese type is suitable for non-standardized raw milk samples in this study. According to study findings, we can say that the cheese type made from non-standardized raw milk for each season should be determined.

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