INNSPUB

RESEARCH PAPER

The statistical control of protein and fat rate in holstein milk for cheese making

Alirıza Şahin[1], **Murat Çimen**[*2]

[1]*Provincial Directorate of Food, Agricultural and Livestock, Tunceli, Turkey*

[2]*Food Engineering Department, Faculty of Engineering, Munzur University, Tunceli, Turkey*

Abstract

The goal of study is to statistically take a decision the influence of the cow breed on the fat and protein rates for quality cheese production. Daily milk data was obtained from a milk company during the first three days of early lactation period of 20 Holstein cows. The fat and protein means of milk were compared with the standard values for quality cheese production (fat min. 3.2%, total protein min. 3.3%) using one-sample t test. Mean and standard error for milk fat and protein rates were 4.0375, 0.00778 and 3.3405, 0.00600 respectively. Since the mean fat and protein rates according to these results are not below the reference value, it can be said that it conforms to the cheese quality standards. From study results, it can be said that there were no negative differences between standard values and observed values in milk fat and protein rates obtained from Holstein cows.

*** Corresponding Author:** Murat Çimen ✉ mcimen19@gmail.com

Introduction

Milk quality used for cheese production is very important for quality products. The cow milk parameters are affected by dam (Yıldırım *et al.*, 2009) and environmental conditions, such as milking (Cetin *et al.*, 2007), weather (Ceylan *et al.*, 2013) and lactation conditions (Cetin *et al.*, 2010). Cow breed is the basic factor affecting milk quality and, consequently, cheese-making knowledge and product quality. Differences in biochemical and technological properties of milk have been greatly indicated among dairy breeds (Auldist *et al.*, 2002, 2004). Animal breed has effective on milk composition. Therefore, these effects must be known for dairy products production. Protein to fat rates in Holstein cow milk generally stable, but fat is more affected by breed of cow according to protein (Fox and Mc Sweeney, 2003). Cow breed has major effect to cheese yield and composition of dairy products (Murphy *et al.*, 2016). There was no enough research in the study area for suitability to quality standards of fat and protein of milk obtained from Holstein cow breed. Only few studies have studied the effect of cow breed on cheese quality.

Researches on statistical control of milk constituents such as fat and protein have been increased in recent years (Çimen, 2016). Statistical controls on dairy products production are important in terms of determination of their quality. In many countries apply to statistical controls for continuity of dairy product quality. That's why; the dairy manufacturers should also focus on statistical control of raw milk affecting cheese quality. The basic aim of this study is to statistically take a decision the influence of the cow breed on the fat and protein rates for quality dairy product output.

Material and methods

Data collection

Daily milk data was obtained from a milk company during the first three days of early lactation period of 20 Holstein cows. In the study, the milk samples were collected daily from each cow.

Analysis of milk samples

Holstein cow milk samples were analyzed for crude protein and fat using the milk auto analyzer (Milkana).

Approximately 100 ml milk sample was taken for analysis and it was transferred to the lab of farm.

Statistical analysis

The data were presented as mean ± standard deviation (Çimen, 2015). The fat and protein means of milk were compared with the standard values (fat min. 3.2%, total protein min. 3.3%) for quality cheese production (Anonymous, 2009; Ulaş and Şahin, 2018) using one-sample t test. Statistical analysis was done with help of the SPSS 25.0 (Norusis, 1993).

Results and discussion

The statistical analysis of fat and protein rates in milk obtained from Holstein cow are presented in Table 1 and 2.

Table 1. One-Sample T-Test Results for Fat.

	N	Mean	Std. Deviation	Std. Error Mean
Fat	20	4,0375	,03477	,00778

		Test Value = 3.2				
					95% Confidence Interval of the Difference	
T-value	Degree of freedom	Sig. (2-tailed)	Mean Difference		Lower	Upper
Fat 107,708	19	,000	,83750		,8212	,8538

The mean fat rate found when looking at Table 1 is above the standard reference value (3.2%). Mean, standard deviation and standard error for milk fat were 4.0375, 0.03477 and 0.00778 respectively. Since the mean fat value found according to these results is not below the reference value, it can be said that it conforms to the cheese quality standards.

Table 2. One-Sample T-Test Results for protein.

	N	Mean	Std. Deviation	Std. Error Mean
Protein	20	3,3405	,02685	,00600

		Test Value = 3.2				
					95% Confidence Interval of the Difference	
T-value	Degree of freedom	Sig. (2-tailed)	Mean Difference		Lower	Upper
Protein 6,746	19	,000	,04050		,0279	,0531

The milk protein mean found as shown the Table 2 is above the reference threshold for desirable protein rate (3.3%). Mean, standard deviation and standard error for protein were 3.3405, 0.02685 and 0.00600 respectively. Since the mean protein ratio found

according to these results is not below the reference value, it can be said that it conforms to the quality cheese production. Tokmak and Cimen (2013) reported that various types of quality cheeses can be obtained with milk from Holstein cows.
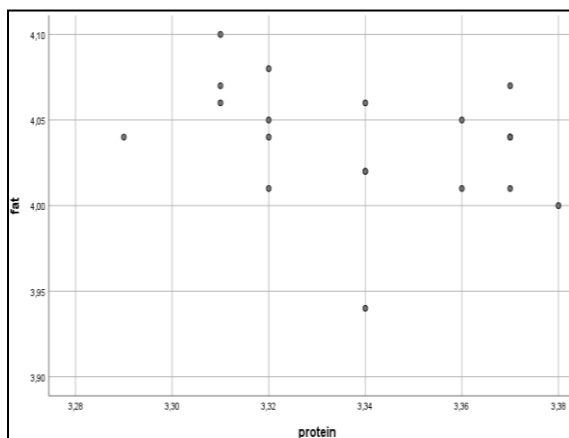

Fig. 1. Simple scatter dot for fat and protein rates of Holstein Breed.

As shown the Fig.1, looking at the scatter plot of the fat and protein values of the Holstein cows, it is seen that the fat and protein values are generally distributed in parallel. It is noteworthy that there is a homogeneity in the data since this distribution type is not an absurd distribution. For this reason, it can be said that the obtained results are relatively homogeneous and reliable. The absurd distribution in the scatter plot between data may also constitute suspicion in terms of research results. However, the harmonious distribution between fat and protein eliminates such a suspicion. Harmonious distributions between protein and fat ratios indicate stability in nutritional and environmental conditions. The effect of nutritional and environmental conditions on each cow is important in ensuring homogeneity in the data obtained from each individual.

From study findings, we can say that there were no negative differences between standard values and observed values in milk fat and protein rates obtained from Holstein cows. Recently, developed countries focused on milk parameters having economic importance such as fat and protein studies on their cow breeds. If the cow breeds of undeveloped or developing countries are native breeds, it will be a

great advantage since they will have high fat and protein content. If the countries in question are going to reclaim to increase the amount of milk, they should be careful not to drop the fat and protein ratio. Milk parameters having economic importance such as fat and protein are of great importance in the increase of dairy products. Although Holstein breeds are high in milk yield, they are sufficient in terms of their fat and protein content for cheese making. There is no need for an extra breeding work for milk fat and protein increase in Holstein breed cows. Because, according to the statistical control results, fat and protein levels do not contain any negative effects for cheese making. However, breeders should pay particular attention to the feeding of cows in order to keep the fat and protein levels of Holstein breed cows at the desired level.

According to these results, milk protein rates were favorable for quality cheese production. Similar to protein results, total fat ratios were convenient for admirable quality in cheese production. It will be beneficial to support the results of the research with other studies. Similar studies should be done not only for the Holstein cow breed but also for other cow breeds.

References

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

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

Auldist 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.

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

Çimen M. 2016. İnek Sütlerinde Yağ Depresyonunun İstatistikî Kontrolü. Zonguldak Karaelmas Üniversitesi Fen ve Mühendislik Dergisi **6(1),** 67-70 (in Turkish)

Fox PF, McSweeney PLH. 2003. Advanced Dairy Chemistry, volume 1, proteins. (3rd Ed). London: Kluwer Academic/Plenum Publishers.

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.

Tokmak A, Çimen M. 2013. **Elazığ İlinde Yetiştirilen Holstein Irkı İneklerden Elde Edilen Sütlerde Protein/Yağ Oranının Farklı Peynir Çeşitleri Yapımına Uygunluğu.** Bilim ve Gençlik Dergisi **1(2),** 24-28 (in Turkish)

Ulaş D, Şahin A. 2018. Effect of summer season on quality of raw milk used for cheese production. International Journal of Agronomy and Agricultural Research **13(4),** 88-91.

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.