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Manufacture and Some Properties of Turkish Fresh Goat Cheese

Sevda Kılıç, Harun Uysal, Gökhan Kavas, Necati Akbulut and Harun Kesenkaş
Department of Dairy Technology, Faculty of Agriculture, Ege University, 35040, Izmir, Turkey

Abstract: Manufacturing and compositional characteristics were studied for Turkish fresh goat cheese using controlled processes. Although heat treatment and lactic acid bacteria addition are not applied in conventional production, pasteurization and starter bacteria were used during controlled manufacturing. Some physico-chemical characteristics and microbiological properties were evaluated at the 1st, 15th and 30th days of storage. Average total solid, fat, protein and salt contents were found, respectively, 38.83, 16.66, 15.42 and 3.56% at the end of 30 days storage. The number of lipolytic and proteolytic bacteria reached maximum value at 15th day and Staphylococci and coliforms were not enumerated at the end of storage period. According to sensory evaluation a weak goat milk flavor was detected in cheeses by panelists and the most acceptable cheese was at 30th day of storage from flavor point of view.

Key words: Goat, fresh cheese, traditional cheese

INTRODUCTION

Goat cheeses are distinctive Mediterranean products; their quality is closely associated with the territory of production and its traditions. An important portion of goat milk in Turkey is produced to traditional products like; Kelle, Çimi, Sepet, Tel, Çivil, Otlu, Küp, Kopanisti, Kırktokmak, Yörük, Abaza cheeses and also many nameless cheeses are produced with goat milk. Because of their sensorial properties, these cheeses are consumed more than cow-milk cheeses by Turkish people living in towns and this situation make it difficult to determine the production, control and economical dimension of the cheeses produced with goat milk.

One of the most produced and consumed traditional goat cheese in Turkey is fresh goat cheese. Many mountain farmers, have neither electric facilities nor refrigeration, thus there is no standardized production method for this kind of cheese. It is produced without pasteurization of milk and without the addition starters. Fresh goat cheese can easily find consumers in regional public markets where they manufactured. Their consumption is risky in terms of health because of production from raw milk and marketing without any ripening process.

The microbiological and physico-chemical characteristics of Turkish cheeses, such as White Pickled[1,2] and Tulum[3], have been examined; however, no research has ever been carried out on fresh goat cheese. Therefore, the purpose of the present work was to perform controlled manufacture and to monitor some microbiological and chemical properties of fresh goat cheese by addition of selected starter culture.

MATERIALS AND METHODS

Whole milk from Faculty farm was pasteurized (72°C, 2 min) and cooled to 28°C. The milk was inoculated at 1.5% with a mixed reactivated lactic starter culture obtained from Wiesby GmbH and Co.KG (*Lc. lactis* ssp. *lactis*+*Lc. lactis* ssp. *cremoris*+*Lc. lactis* ssp. *biov. diacetilactis*, 2:2:1) and 0.02% $CaCl_2$. Rennet was added at a ratio of 8 ml per 100 L milk after pre-ripening for 40 min. Following formation of the coagulum, it was cut and the whey was removed by pressing manually for 3 h. The curd was cut again, dry-salted and loaded into plastic cheese moulds. Then cheeses were packed by polyethylene containers and stored for 30 days at 4°C.

In cheese samples, total solids, fat, total protein, salt content, titratable acidity (°SH)[4], pH (using a Hanna 210 pH-meter) were determined. Microorganisms were counted as colony forming units (cfu) using PDA for yeast and mould[5], Ca-Caseinate agar for proteolytic bacteria, Tributyrin agar for lipolytic bacteria, Mannitol Salt agar for Staphylococci and VRB agar for coliforms[6]. The experiment was repeated 3 times and ANOVA was performed using the GLM procedure of S.A.S.[7].

RESULTS AND DISCUSSION

Results obtained from the physico-chemical analyses of cheeses are shown in Table 1. The decrease in the total

Corresponding Author: Dr. Sevda Kılıç, Department of Dairy Technology, Faculty of Agriculture, Ege University, 35040, Izmir, Turkey Tel: +90 232 388 01 10 Fax: +90 232 388 18 64 E-mail: kavas@ziraat.ege.edu.tr

Table 1: Some properties of fresh goat cheese (n=3)

	Storage time (d)				
Parameters	1	15	30	X	S_x
Total solids (%)	39.88	37.92	38.69	38.83	0.807
Fat (%)	17.00	16.33	16.66	16.66	0.272
Protein (%)	15.96	14.89	15.41	15.42	0.438
Salt Content (%)	3.66	3.50	3.52	3.56	0.069
Acidity (°SH)	47.46	56.79	60.30	54.85	5.416
pH	5.00	5.00	5.03	5.01	0.016

solid contents during storage was found non-significant. The decrease was accepted to be normal due to the components having been broken and passed to the whey during the storage of the cheeses. Hosono and Shirota[8] determined the average total solid content 40.85% in Crottin de Chavignol cheese, Hosono and Shirota[9] determined this value 39.92% in Valençay cheese. The values gained in this study are appeared to be consistent with the study results.

The fat content during the storage period decreased comparing to the 1st day, depending on the total solid content, but this decrease was found to be statistically non-significant. Hosono and Shirota[8,9] determined the total solid content in Crottin de Chavignol cheese as 22.85%, in Valençay type cheese as 20.40%. Results are appeared to be lower than the values showed by these researchers. The lower fat content was found to be closely related with the fat content of the milk produced to cheese and with the whey drainage.

During the storage period, a decrease was also determined in protein content comparing to the 1st day and the lowest protein content was found on the 15th day. The decrease in the protein content is lower than both total solid and the fat content. The decrease of the protein content during the storage period was found to be statistically non-significant. The protein values determined in the study is close to the values of Requena *et al.*[10] and Carballa *et al.*[11].

While the highest salt value was determined on the first day, the lowest salt content during the storage was determined on the 15th day. According to the statistical analysis, the variations in salt content during the storage were determined to be non-significant. Davide *et al.*[12] was found average salt content 1.61% in different lactic goat cheeses, while Garcia *et al.*[13] determined this value as 2.97% in Rocamador cheese. The salt values of present samples are higher than the values of other researchers.

Acidity generally, increases throughout the ripening of cheese. This increase, to a certain degree, is the indication of ripening of cheeses. Significant differences were found between cheeses in acidity (°SH) during 30 days storage ($p<0.05$) but the storage period was found to be non-significant on the pH values. In various studies, it was determined that the pH of the lactic goat cheeses

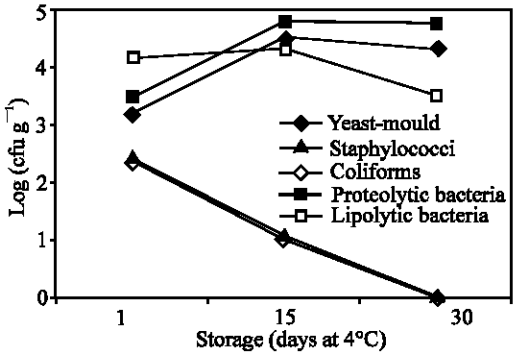

Fig. 1: Microbiological analysis of fresh goat cheese during 30 days period

were showed different values like 4.48, 5.07 and 5.42, respectively[9,14,15].

Figure 1 shows the results obtained in the microbiological analysis of cheeses. The maximum number of mould-yeast was indicated as 10^2 cfu g^{-1} in the standards of the most cheeses like White Cheese[5]. It was determined that the number of mould-yeast in the samples was higher than the value given in the Turkish White Cheese Standard. Even both microorganisms remain very low during the pasteurization of milk; it is enough for them to grow in number in the coagulum of the cheese during the storage. However, the contamination probability should also be considered during the production process. Some of those remained in the milk without damaged because of their resistance to the heat treatment; as a result they were determined in the cheese. However, they increased in number during storage initially and then decreased due to oxido-reduction potential and metabolites existed in mass.

The number of the proteolytic and lipolytic bacteria of the cheeses increased to the maximum value on the 15th day. The storage period was not effective on the counts of these microorganisms. It was determined that the number of Staphylococci (*Staphylococcus aureus* was not found between these species) and coliform bacteria in the cheeses decreased gradually and on the 30th day they were completely disappeared (Fig. 1). The storage period was also not effective on the counts of Staphylococci and coliform bacteria.

While there was not any unfamiliar taste in the cheeses produced, the panelists determined that they tasted a weak goat milk flavor. The cheeses were perceived salty and the flavor on the 30th day was the most liked. Panelists also determined that the taste peculiar to the goat perceived initially was decreased on 30th day. It was determined that using culture in the production gave better smell and taste to the cheeses. The appearance of the cheeses was seen to be whiter than cow milk cheeses and its coagulum was in little rough,

breakable structure. This shows that more attention must be paid during the treatment of coagulum.

As a result, it was proved that without having any risk in terms of health, the traditional fresh goat cheese can be produced in the cheese production factories with standardized method and the cheeses produced are acceptable in terms of both chemical and sensorial properties.

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