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The Microbiological and Chemical Quality of Sikma Cheese Produced in Turkey

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Abstract: In this study, 34 sikma cheese samples, collected from Kahramanmaras province of Turkey were investigated and revealed that they contained 53% dry-matter (DM), 43.87% fat in DM, 20.25% protein, 3.28% WSP, 6.12% salt in DM. The average titre table acidity and ripening degree were 1.71 and 17.05% respectively. The coliform, TAMB, LAB, Lipolytic and proteolytic microorganisms and yeast-mould counts were 5.99, 7.82, 7.01, 5.73, 4.56, 5.03 log cfu/g in success in cheese samples.

Key words: Sikma cheese, production technique, chemical and microbiological properties

Introduction

The major cheese types that produced in Turkey are White pickled cheese, Tulum cheese and Kasar cheese. In addition, some traditional cheese types, varying in taste, flavor and texture due to type and composition of milk, casing material, production methods and microbial flora and their activity during ripening period, and ripening conditions are also locally produced. Among which are, mihalic, lor, civil, dil, otlu (herby), cokelek, abaza cheese (Atamer, 1986), which are known and preferred by limited number of people.

Sikma cheese is mainly produced from sheep milk using rennet within 1-2 hr. Fig juice had been used previously for curd formation for sikma cheese. Fig juice was dried on a cloth and stored, when required it was dissolved in warm milk and then used in cheese production. This method has been completely abandoned now. The curd is transferred into small cloth sacks. Whey is strained with help of a weight and then cut into pieces that can be processed with hand. Salt is sprinkled; the curd is left to leak the whey for two or three days and then scalded in water of 55-60 °C to acquire a proper consistency. Squeezing the curd within two hands, excessive water is removed, and then cooled and pickled in brine.

The aim of this study was to reveal microbiological quality, physical properties and chemical composition of sikma cheese, having unique aroma/flavor, and textural characteristics, and produced largely in small-scale dairies and family farms, into national and international dairy markets.

Materials and Methods

34 sikma cheese samples collected from local retailers in Kahramanmaras, a southeastern province, were investigated.

Chemical Analysis: The sikma cheese samples were analyzed for moisture, fat, protein, NaCl and titre table acidity as outlined by Kurt *et al.* (1993). The fat content was determined by the Gerber method (Anonymous, 1978).

Microbiological Analysis: Appropriate dilutions of samples that homogenized (11 g in 99-ml physiological saline solution of 0.85% NaCl) were incubated in Violet Red Bile Agar (VRBA) (Oxoid) for coliform bacteria counts, Potato Dextrose Agar of pH 3.5 adjusted with 10% tartaric acid (PDA) (Oxoid) for yeast-mould counts, Plate Count Agar (PCA) (Oxoid) for total aerobic mesophilic bacteria counts and MRS Agar (Oxoid) for lactic bacteria counts at 37, 22, 32 and 35 °C for 24 h, 5d, 48h and 72h. The colonies with characteristic properties were counted for coliform, yeast-mould, total aerobic mesophilic and lactic bacteria counts respectively (Hausler, 1972; Speck, 1976).

Results and Discussion

The gross composition of sikma cheese samples is presented in Table 1. The average dry-matter content was 53.00% changing between 37.38 and 63.17%. The differences between samples are due the fact that this type of cheese relies upon individual dairies, and there is no standard manufacture method. The average fat in dry-matter (FDN) content of cheese samples was 43.87%, changing from 30.08 to 53.61%. It is necessary that dry matter and the fat content of sikma cheese be standardized. TWCS TS-591 sorts in the cheese classes according to fat in dry matter content (Anonymous, 1989) which suggests that fulfat cheese contain at east 45%, fatty cheese contain at least 30% FDM. Of the 34 samples investigated 13 sikma cheese were full fat, the rest were fatty cheese. The protein content of cheese samples changed from 14.67 to 29.45%, the average was 20.25% indicating that it was an important protein source. The water soluble protein content of sikma cheese samples ranged between 1.48

Table 1: The Results of Some Chemical Parameters of sikma Cheese

Chemical composition	Statistical parameters					
	n[a]	X[b]	Range	Cv[c]	Sd[d]	SEX[e]
Dry-matter (%)	34	53.00	37.38-63.17	109.254	57.579	0.9875
Fat (%)	34	23.28	11.60-28.78	161.412	37.569	0.6443
Protein %	34	20.25	14.67-29.45	194.832	39.422	0.6761
Salt (%)	34	3.24	0.12-5.03	468.248	14.601	0.2504
%Acidity	34	1.71	0.90-4.04	416.450	0.7109	0.1219

[a]Number of sample analyzed; [b]Mean; [c]Coefficient of variation; [d]Standard deviation; [e]Standard error of mean

Table 2: The Results of Some Microbiological Quality of Sikma Cheese (Log cfu/g)

Microorganism groups	Statistical parameters					
	n[a]	X	Range	Cv[c]	Sd[d]	SEX[e]
Coliform	34	5.99	4.04-7.42	165.252	0.9905	0.1699
TAMB	34	7.82	5.90-8.72	97.761	0.7644	0.1311
Lactic	34	7.01	5.30-8.02	122.629	0.8594	0.1474
Lipolytic	34	5.73	3.78-7.76	156.760	0.8986	0.1541
Proteolytic	34	4.56	2.84-5.38	178.685	0.8141	0.1396
Yeast and mould	34	5.03	2.70-6.40	216.197	10.867	0.1864

[a]Number of sample analyzed; [b]Mean; [c]Coefficient of variation; [d]Standard deviation; [e]Standard error of mean

Table 3: Correlation Between Microorganisms and Chemical Composition of Sikma Cheese

Chemical composition	Coliform	TAMB	Lactic	Lipolytic	Yeast - mould	Proteolytic
Drymatter (%)	-0.064	-0.35l*	0.395*	0.025	-0.254	-0.198
Fat (%)	0.021	-0.072	-0.252	0.122	-0.263	0.061
Protein (%)	0.154	-0.127	-0.093	-0.067	-0.165	-0.317
Salt (%)	-0.166	-0.206	-0.206	0.060	0.070	-0.004
Acidity %	0.162	0.093	0.103	-0.026	-0.208	-0.079

*Correlation coefficient, significant at the p<0.05 level

Table 4: Correlation Between the Various Microorganisms and Chemical Composition of Sikma Cheese

Microorganism	Coliform	TAMB	Lactic	Lipolytic	Yeast - mould
Coliform	-	-	-	-	-
TAMB	0.672**	-	-	-	-
Lactic	0.087	0.468**	-	-	-
Lipolytic	0.361*	0.174	-0.387*	-	-
Yeast-mould	0.386*	-0.170	0.049	0.232	-
Proteolytic	0.041	0.237	-0.037	0.374*	0.304

*Correlation coefficient at the p<0.05 level, **significant at the level p<0.05

and 6.73%, the average was 3.28%. The ripening degree of samples were within 5.15 and 33.59%, average was 17.05%. According to TWCS TS-591, all the samples except one can be considered as semi-ripened cheese. The average salt in dry matter content of samples was 6.12%, changing from 0.25 to 10.06%. All samples except one conformed to the TWCS TS-591, which permits maximum 10% salt in dry matter.

The average titre table acidity of samples was 1.71%. There was an apparent variation in titre table acidity changing from 0.90 to 4.04%. The TWCS TS-591 limits the titre table acidity of white pickled cheese maximum 3%. The lactic acid does not only contribute the taste of fresh cheese but it also helps cheese maintain its convenient body, structure and protects it against some kind of microbiological spoilage. 33 out of 34 samples conformed to the TWCS TS-591 limits.

The variation among chemical composition and itretable acidity of cheese samples arose probably from the lack of a standard production process and the variation in composition and properties of milk processed.

The coliform, total aerobic mesophilic bacteria (TAMB), lactic, lipolytic, proteolytic bacteria, yeast and mould counts were shown in Table 2.

The average coliform count determined was 5.99 log cfu/lg cheese changing between 4.04 log cfu/lg and 7.42

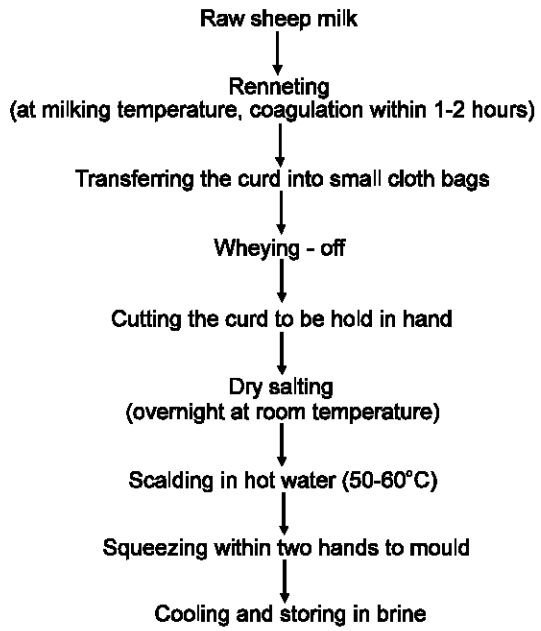

Fig. 1: Schematic diagram of sikma cheese production

log cfu/lg. Turkish White Cheese Standard TS-591 (TWCS) suggests that white cheese shouldn't contain more than 100 cfu/lg coliform bacteria, it should never contain *E. coli*. None of the samples investigated conformed to the Standard (Anonymous, 1989). The high coliform content despite scalding is interestingly indicates the post contamination during storage. The great variation was observed between samples, which could be related to the stage of ripening, and production under conditions not assuring good microbiological quality. The significant ($p<0.01$) positive correlation between coliform bacteria and TAMB was in line with findings by Yetismeyen and Yildiz (2001) in Urfa cheese. The coliform group bacteria counts in cheese are expected to decrease during ripening by low pH and antagonistic action of lactic acid bacteria (Babel, 1977). The total aerobic mesophilic bacteria (TAMB) counts ranged from 5.90 log cfu/g to 8.72 log cfu/g, the average was 7.82 log cfu/g. The differences found between cheeses samples can be explained by the microorganisms contents of raw milk processed. This is rather high despite the scalding process indicating poor sanitary handling conditions prevailing during milk handling, cheese making and marketing. There were significant negative correlation between TAMB and drymatter content ($p<0.05$), salt in drymatter, and a positive correlation with LAB count ($p<0.01$). The effect of salt content on TAMB was not surprising due to the role of NaCl in increasing osmotic pressure and lowering a_w. The LAB is reported to be the main microorganisms in cheese. The average number of lactic acid bacteria (LAB) was 7.01 log cfu/g ranging from 5.30 to 8.02 log cfu/g. It was interesting that a significant negative correlation ($p<0.05$) was recorded between LAB and lipolytic bacteria count. The metabolic properties of LAB is reported to be of primary importance in cheese flavor development (Steele and Ünlü, 1992). The lipolytic and proteolytic bacteria counts were lower than LAB (Table 2). A significant ($p<0.05$) positive correlation was found between lipolytic and proteolytic bacteria counts (Table 3).

The yeast and mould counts ranged from 2.70 to 6.40 cfu/g. The average was 5.03. All the samples had yeast and mould counts higher than the limits (<100 cfu/g) of TWCS TS-519 (Anonymous, 1989). A significant ($p<0.05$) negative correlation ($r=0.4014$) was found between yeast-mould counts and coliform count probably due to acid forming ability. The TAMB counts were significantly ($p<0.01$) correlated with coliform and lactic bacteria counts (Table 4).

Conclusions: Sikma cheese is a traditional cheese type with high nutritious value, a unique taste and aroma, and it has a promising marketing potential. It is essential that a standardized production process on industrial scale be developed and hygienic quality be improved. More cooperation between producers, processors, retailers, public health authorities and government is also essential.

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