

The Microbiological and Chemical Quality of Orgu Cheese Produced in Turkey

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Abstract: The chemical composition and microbiological properties of Orgu cheese, locally produced in Turkey, was investigated. The moisture, fat, protein, salt and % acidity were 52.25, 17.86, 19.96, 5.32 and 1.11% respectively while coliform, TAMB, LAB, Lipolytic and proteolytic microorganisms and yeast-mould counts were 3.73, 6.89, 6.78, 5.29, 4.50 and 5.45 cfu/gin success in cheese samples.

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

Introduction

Cheese is an important integral part of diet consumed in Turkey. It is consumed almost three times a day in Turkey. In addition to three major cheese types, white pickled cheese, kasar cheese, tulum cheese, there are many traditional cheese types produced and consumed in local regions. Orgu cheese is one of the common traditional cheese types in Turkey, becoming more popular and preferred almost all over Turkey. The name 'Orgu' was inspired by the knitted structure of Orgu cheese.

The objective of this study was to introduce the production process of Orgu cheese and reveal its microbiological quality and chemical composition.

Orgu cheese is produced especially in eastern regions of Turkey from sheep milk. During summer when sheep milk production increases sheep milk is processed into orgu cheese. When sheep milk production is insufficient, some cow or goat milk may be added (Akyüz *et al.*, 1998).

Sheep milk is filtered through a piece of cloth and renneted at milking temperature with commercial liquid rennet. The amount and strength of rennet used is not standard, changing due to craftsman. Within 30-120 minutes, when curd formation is completed, it is transferred into cloth bags of 20x20 cm, whey is drained within 5-6 hr and then the curd is transferred from cloth bags, mixed and left for 60-90 mm for lactic acid fermentation at ambient temperature. After tasting the curd, craftsman decides when to stop lactic acid fermentation. Following fermentation, below pH 5, when the curd takes the optimum properties to stretch and process, the curd is scalded in hot water at 70-80 °C for 5-6 minutes using lad. The scalded curd is stretched like a sting of 1 cm in diameter. Both the insufficient and excessive fermentation leads the curd to lack the convenient structure to process. Three strings are knitted together and than cut approximately 10 cm in length.

The orgu cheese is usually consumed either fresh or ripened for 60 days in brine of 12-15% salt.

The acidity and chemical composition of milk, the temperature and period of renneting, the strength and amount of rennet, and ripening period change from region to region and craftsman resulting in orgu cheese with various properties. The consumers in big cities like Istanbul and Ankara prefer orgu cheese made in special regions.

The aim of this study was to reveal some chemical and microbiological properties of orgu cheese, which is of nationwide use and export potential.

Materials and Methods

Orgu cheese samples collected randomly from local retailers in Kahramanmaraş province were investigated in Research Laboratory of Food Technology of Ataturk University, Erzurum, Turkey. The samples were transported in an ice chest and stored at 5 °C before analysis.

Microbiological Analysis: Each sample was homogenized (11 g in 99ml physiological saline solution of 0.85% NaCl) and diluted. Appropriate dilutions were transferred to 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. After incubation at 37, 22, 32 and 35 °C for 24 h, 5d, 48h and 72h colonies with characteristic properties were counted for coliform, yeast-mould, total aerobic mesophilic and lactic bacteria counts respectively (Hausler, 1972; Speck, 1976).

Chemical Analysis: The cheese samples were analyzed for moisture, fat, protein, NaCl and titratable acidity as outlined by Kurt *et al.* (1993).

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

Chemical composition	Statistical parameters					
	n ^a	X ^b	Range	Cv ^c	Sd ^d	SEX ^e
Moisture (%)	29	52.25	44.34-58.71	9.47	3.08	0.57
Fat (%)	29	17.86	13.0-21.0	3.91	1.98	0.37
Protein %	29	19.96	16.0-22.71	3.74	1.92	0.36
Salt (%)	29	5.32	3.51-7.31	0.83	0.91	0.17
%Acidity	29	1.11	0,34-1,65	0.14	0.38	0.07 ^a

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

Microorganism groups	Statistical parameters					
	n ^a	X ^b	Range	CV ^c	Sd ^d	SEX ^e
Coliform	29	3.73	0.00-6.06	2.56	1.6	0.3
TAMB	29	6.89	5.59 - 8.37	0.57	0.76	0.14
Lactic	29	6.78	4.67 - 7.94	0.41	0.64	0.12
Lipolytic	29	5.29	3.68 - 6.49	0.56	0.75	0.14
Proteolytic	29	4.5	3.00-5.75	0.54	0.73	0.13
Yeast and mould	29	5.45	3.30 - 7.45	1.51	1.23	0.23

^aNumber of sample analyzed; ^bMean; ^ccoefficient of variation; ^dStandard deviation; ^eStandard error of mean

Results and Discussion

Mean concentrations of moisture, fat, protein, salt, and % acidity were 52.25, 17.86, 19.96, 5.32 and 1.11% respectively (Table 1).

The moisture content of orgu cheese samples ranged from 44.34 to 58.71%. The average moisture content was 52.25%. Orgu cheese being pickled in brine like white cheese (Feta cheese) was evaluated according to Turkish white cheese standard (TWCS) TS-591 (Anonymous, 1989) which requires that pickled white cheese contain maximum 60% moisture. All the cheese samples investigated were within the range of the standard. Considering the fact that dry matter content of cheese the indicates its nutritive value, orgu cheese is one the valuable, nutritious cheese types.

The average fat content in dry matter of cheese samples was 37.6%, changing from 29.5 to 43.1%. The fat content of orgu cheese need to be standardized. TWCS TS-591 sorts in the cheese classes according to fat in dry matter content (Anonymous, 1989). All the samples should be considered in fatty cheese class.

The protein content of cheese samples changed from 16.0 to 22.71%, (the average 19.96%) indicating the rich protein source.

The ripening degree of samples were within 9.33 to 19.14%, (average 13.62%). According to TWCS TS-59 1 all the samples can be considered as semi-ripened cheese.

The average salt in dry matter content of samples was 11.2%, changing from 7.94 to 14.90%. Only 8 out of 29 samples conformed to the TWCS TS-591 which permits maximum 10% salt in dry matter (Anonymous, 1989).

The average titratable acidity of samples was 1.11% with

an important variation in changing from 0.34 to 1.65%. The TWCS TS-591 limited the titratable acidity of white pickled cheese maximum 3% (Anonymous, 1989). The lactic acid did not only contributed the taste of fresh cheese but also helped cheese maintain its convenient texture, and protect it against any kind of microbiological spoilage.

Similar results were reported in comparable cheese samples. Ozdemir *et al.* (1998) reported that DM, FDM, protein contents and ripening degree of orgu cheese samples collected from Diyarbakir Karacadag region, a southeastern city of Turkey, as 44.84, 32.23, 21.69, 22.86, 5.11 and 3.03% respectively. Akyuz *et al.* (1998) reported that orgu cheese samples collected from Diyarbakir contained 42% DM, 40.47% FDM, 15.83% protein, with 0.80% acidity.

The apparent variation among chemical composition and percent acidity of cheese samples arose probably from the lack of a standard production process.

The average coliform count determined was 3.73 log cfu/g changing between >10 log cfu/g and 3.73 log cfu/g (Table 2). Turkish White Cheese Standard TS-591 (TWCS) suggests that white cheese should contain no more than 100 cfu/g coliform bacteria, and no *E. coli*. Of 29 Orgu cheese samples investigated, only 4 sample conformed to the Standard. The average coliform count was higher than those reported both by Ozdemir *et al.* (1998) and Akyuz *et al.* (1998).The coliform counts had a positive correlation with moisture content ($r=0.474$) and negative correlation with percent acidity ($r=-0.379$) ($p<0.05$) (Table 3).

Cheese samples were contaminated following scalding process, most probably during storage period. Strict

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Table 3: Correlation Between the Various Microorganisms and Chemical Composition of Orgu Cheese

Chemical composition	Coliform	TAMB	Lactic	Lipolytic	Yeast - mould	Proteolytic
Moisture (%)	0.4740*	0.1206	-0.0177	0.1285	0.3400	0.4642*
Fat (%)	-0.3602	-0.1440	-0.1592	-0.2192	-0.1309	-0.3105
Protein (%)	0.1249	-0.0433	-0.0296	0.2406	-0.0795	-0.2215
Salt (%)	-0.1406	0.2069	-0.0572	-0.0318	-0.2651	-0.1370
Acidity %	-0.3238	-0.2236	0.1793	-0.1016	0.4014*	0.0903

*Correlation coefficient, significant at tile P<0.05 level

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

Microorganism	Coliform	TAMB	Lactic	Lipolytic	Yeast – mould
Coliform	-	-	-	-	-
TAMB	0.4067*	-	-	-	-
Lactic	0.3273	0.2137	-	-	-
Lipolytic	0.3645	0.184	0.0059	-	-
Yeast-mould	0.3515	-0.0974	-0.2076	0.5108*	-
Proteolytic	0.1027	-0.1374	0.2803	0.3155	0.1105

*Correlation coefficient, significant at tile P<0.05 level

measures should be taken to prevent recontamination. The total aerobic mesophilic bacteria (TAMB) counts ranged from 5.59 to 8.37 log cfu/g, the average was 6.89 log cfu/g. The results were well in line with those reported by Ozdemir *et al.* (1998) and Akyuz *et al.* (1998). However the TAMB counts were lower than those of other traditional cheese types made from unpasteurized milk (Çakmakçi *et al.*, 1995), it is rather high despite the scalding process. No significant correlation was found between TAMB and chemical composition of orgu cheese samples.

The average number of Lactic acid bacteria (LAB) was 6.78 log cfu/g. Ranging from 4.67 to 7.94 log cfu/g (Table 2). LAB are the dominant flora of cheese (Kurt, 1996). For comparison, Ozdemir *et al.* (1998) found average LAB 1.0×10^7 cfu/g. The LAB number of cheese samples analyzed was rather lower than those of other traditional cheese types (Çakmakçi *et al.*, 1995), probably due to scalding process.

The lipolytic and proteolytic bacteria counts were lower than LAB (Table 2). A significant ($p < 0.05$) positive correlation ($r = 0.4642$) was found between moisture content and proteolytic bacteria count (Table 3).

The yeast and mould counts ranged from 3.30 to 7.45 log cfu/g. The average was 5.45. The results were in line with those reported by Ozdemir *et al.* (1998) (1.0×10^5 cfu/g) and Akyuz *et al.* (1998) (5.238 log cfu/g) 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 and mould counts and percent acidity of samples (Table 3). This result could be account for the fact that yeast and mould could metabolize the lactic acid and lowered percent acidity (Table 4).

Recommendations: Orme cheese is one of the promising traditional cheese types in view of its high

nutritional value and unique taste and aroma. This study clearly indicated the importance of production process, fat in dry matter contents, acidity and the strength and amount of rennet used. renneting time and temperature. casing and storage conditions should be standardized. The use of starter culture and nonstarter lactic acid bacteria should be investigated. On the other hand strict measures should be taken to prevent recontamination during production and storage.

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