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Chemical and Microbiological Properties of Kashar Cheese with Tomato Puree

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ABSTRACT

Chemical and microbiological properties of Kashar cheeses with and without tomate puree (1 and 2%) were determined in this study. Lycopen and protein contents and antioxidant activity of Kashar cheeses with tomatoes puree were significantly different from those of control (p<0.01). The ranges of total mesophilic aerobe microorganims in cheese samples with 1 and 2% tomatoes puree and control were 4.7-6.20, 4.07-6.35 and 4.18-5.16 log cfu/g, respectively. Lactococcus microorganism counts were higher than lactobacilli. The ranges of the antioxidant activity, expressed as the inhibition ratio, in control, and samples with 1 and 2% in tomatoes puree were 10.51-25.71, 15.37-30.27 and 16.67-30.68%, respectively. Lycopene content of cheeses was directly proportional with the amount of tomato puree added. Lycopene contents ranged from 0.32 to 2.47% in control samples whereas from 8.52 to 21.47% and from 19.08 to 40.39% in cheese with 1 and 2% tomato puree, respectively. Texture profile analysis indicated that the difference in hardness ratios was significant among the cheese samples (p<0.01).

Key Words: Kashar cheese, Lycopene, Antioxidant activity, Tomato puree

Domates Püreli Kaşar Peynirinin Kimyasal ve Mikrobiyolojik Özelliklerinin Belirlenmesi

ÖZET

Bu çalışmada, kaşar peyniri üretimi %1 ve 2 oranlarında domates püresi kullanılarak gerçekleştirilmiştir. Kontrol grubu peynirlere püre katılmamıştır. Domates püreli kaşar peynirleri, kontrol grubu peynirler ile karşılaştırıldığında, likopen içeriği, protein, antioksidan aktivite açısından gruplar arasında önemli fark olduğu görülmüştür (p<0.01). Toplam mezofilik aerop mikroorganizma %1 püre katılan peynirlerde 4.7-6.2 log kob/g, %2 püre içerenlerde 4.07-6.35 log kob/g, kontrolde ise 4.18-5.16 log kob/g tespit edilmiştir. Laktokok sayım sonuçları laktobasillerden yüksek bulunmuştur. Antioksidan aktivite, yüzde inhibisyon oranı olarak ifade edilmiştir. İnhibisyon oranı kontrol peynirlerinde %10.51-25.71, %1 domates püresi içeren peynirlerde %15.37-30.27, %2 püreli peynirlerde ise %16.67-30.68 bulunmuştur. Likopen içerikleri ise katılan domates püresinin miktarıyla doğru orantılı olarak değişmiştir. Likopen miktarı kontrol peynirinde % 0.32-2.47, %1 püreli kaşar peynirlerinde %8.52-21.47, %2 püre içerenlerde ise %19.08-40.39 belirlenmiştir. Tekstür profil analiz sonuçlarına göre, peynirlerin sertlik oranlarındaki farklılık gruplar arasında önemli bulunmuştur (p<0.01).

Anahtar Kelimeler: Kaşar peyniri, Likopen, Antioksidant aktivite, Domates püresi

INTRODUCTION

Kashar cheese is produced traditionally from raw or pasteurized cow milk by local dairy plants or the dairy industry. In Turkey, it is estimated that approximately 75610 tons of Kashar cheese is produced per year [1]. Kashar cheese is similar to some other type of cheeses such as Caciocavalle, Provolone, Regusono, Kashkaval produced in Middle and Eastern Europe. Furthermore, fresh Kashar cheese (i.e. before maturation) also shows partial similarity to the 'Pasta Filata' type cheese such as Mozarella [2]. Some researchers find similarity between Cheddar and Kashar cheese [3, 4]. Traditionally, Kashar cheese is made from raw milk and the flora of milk (lactic acid bacteria) is used for maturation. However, due to the risk of food pathogenes, pasteurized milk is used at present and yoghurt is used as starter culture.

Tomatoes and related tomato products are the major source of lycopene compounds. They are also considered an important source of other carotenoids in human diet. Lycopene in fresh tomato fruits occurs essentially in the all *trans*-configuration. Lycopene is not converted to retinol *in vivo*. Bio-availability of lycopene in processed tomato products is higher than in unprocessed fresh tomatoes [5].

Lycopene has recently received attention for its potential role in preventing prostate cancer and cardiovascular diseases in humans [6-8]. It is a natural antioxidant due to its ability to act as a free radical scavenger. It has the highest singlet oxygen quenching rate of all carotenoids in biological systems [9, 10]. Lycopene concentration in fresh tomatoes may vary from 5 to 50 mg/kg, depending on the cultivar, ripening stage, and temperature during crop growth [7, 11].

Cheese is one of the oldest and health beneficial food products and in the recent years numerous studies have been published on the health effects of cheese. Most of the health benefits linked with cheese consumption have been attributed to the calcium present in these products [12, 13], other nutrients found in dairy products such as protein, phosphorus, magnesium, and vitamin D (if fortified) also support bone health. There is further potential for delivery of health beneficial ingredients through cheese products.

In this study it is aimed to produce a functional cheese product, to determine the antioxidant activity and lycopene content of kashar cheese with tomato puree, to determine the chemical, microbiological, and sensory characteristics of Kashar cheeses, and to find the correlation between these properties.

METHODS

Materials

The cows' milk was supplied by the Animal Science Department of Suleyman Demirel University. Microbial rennet (Mayasan A.S., Istanbul, Turkey) was used to coagulate the milk.

Cheese Production

Cheese production was carried out in the Department of Food Engineering in Suleyman Demirel University. For the production process, 25 kg of milk were used for each batch. Tomato puree were added to cheese milk at 1-2% ratio, 30°C and mixed. Tomato puree was not mixed into control cheese. One block of fresh Kashar cheese was approximately 350 g. The blocks of cheeses were vacuumed at 4-6°C for 90 days. Cheese samples were taken for chemical, textural, and sensory analysis on the 1st, 30th, 60th, and 90th days of storage. Cheese was manufactured in duplicate for each group.

Chemical analysis

Dry matter (DM) content of cheese samples was determined by gravimetric method [14], fat content by Van-Gulik method [15], and total nitrogen (TN) content by Kjeldahl method [16]. The protein content of cheeses was calculated by multiplying the TN content by 6.38 and the moisture in non-fat substance was calculated according to the Codex Alimentarius for Milk and Milk Products [17]. Lycopene contents of tomaoto puree and cheese samples were determined with spectrophotometric method [18, 19]. Antioxidant activity of cheese was made by 1.1-diphenyl-2-picrylhydrazyl radical (DPPH) inhibition assay and inhibition rate was calculated [20, 21].

Colour Analysis

Colour values by the CIE Lab method was analysed on 1st, 30th, 60th, and 90th days of storage of samples. Minolta CR-300 Model colorymeter was used to measure the colour of the samples. L*, a*, and b* values were read from the samples. The L* value ranges between 0 and 100 and was used as a measure of lightness. Positive or negative increases of a* value correspond to increases in red or green colour proportions. The b* value represents colour ranging from yellow (+) to blue (-).

Microbiological Analysis

Total mesophilic aerobic bacteria (TMAB) was counted by plating the appropriate dilution of cheese sample on Plate Count Agar (Merck, Germany) and incubated, at 30°C for 48 h. Coliform bacteria were determined on Eosine Metilen Blue agar (Merck, Germany) at 37°C for 24 h. *Lactobacilli* were counted on MRS agar, *Lactococci* on M17 agar, at 28°C for 48 h [22, 23]. Yeast and moulds were determined on Potato Dextrose Agar (Oxoid) acidified with 10% lactic acid (Merck, Germany) following the surface plate method, with incubation at 20-25°C for 5 to 7 days [24].

Textural Analysis

Texture profile analysis (TPA) parameters were determined by using Lloyd LF Plus Nexygen 4.1 equipped with a 100 kg load cell. Cylindrical probe diameter was 9 mm. The operating conditions were:

crosshead speed 50 N chart speed 100 mm/min 70% of compression ratio from the initial height of the sample. Texture values were the mean of three replicates tested each sampling time. Max force was determined as Newton (N) [25].

Sensory Evaluation

Sensory evaluation was carried out with scoring test by six panelists who are the members of Food Engineering Department. The panelists were selected on the basis of their interest in sensory evaluation of cheeses and trained by using the Turkish Standard of Kashar Cheese (TS 3272). The cheeses were evaluated for appearance, flavour, texture, and overall acceptability using a score from 1 to 5 [26].

Statistical Analysis

All the statistical analysis were conducted using the SPSS (Version 17.0) commercial statistical package. Significant mean values were compared using Duncan test on the level of $p<0.01$ and standard deviations for mean values of chemical analysis were also calculated.

RESULTS

Composition of Cheeses

The compositions of control cheese and cheeses with tomato puree (1-2%) are given in Table 1. Wide ranges in acidity and chemical composition were observed. The titratable acidity (SH) of cheeses ranged from 51.75 to 115.50 with an average value. DM of cheeses steadily increased throughout ripening due to water surface evaporation. No differences in DM content were observed between cheeses groups during the ripening. DM and salt in DM contents in the cheeses varied from 48.24 to 50.79 and 2.87 % to 6.84% respectively. The cheese samples were within the reported mean value limits for moisture (maximum 40%) and salt-in-DM (maximum 7%) according to Turkish Standards for aged Kashar cheese [26]. Fat-in-DM content in the cheeses were high (48.89%-53.77 %) and hence the samples tested can be categorised as full-fat cheeses.

Significant difference were not detected in fat ratio between trial cheese samples ($p>0.05$). The values of the fat in DM during the ripening were observed to rise and fall depending on changes in DM.

Titratable acidity of cheese samples was seen steady increase during the ripening. Initially, the cheese with 2 % tomato puree gave the highest acidity and at the end of cheese ripening acidity gave the highest value. Similar results had also been reported by Akyuz [27] and Halkman *et al.* [28].

During ripening, TN ratios always showed a decline in the cheeses with tomato puree. From the beginning, the cheeses with tomato puree, 2% of the TN was low. During the ripening, the change of TN in cheese groups was found significant ($p<0.01$). The TN content was found to be within acceptable levels for Kashar cheese. Results obtained in this study are in agreement with results of studies performed by other workers [27, 29-32].

During ripening, the most important changes observed in proteolysis were in line with the specific acquired qualities of the cheeses. As can be seen from Table 1, the water-soluble nitrogen (WSN) content of all samples increased during ripening. Initially, the lowest value of WSN was investigated in 2% of the tomatoes puree cheese; however, after ripening for 90 days, it gave the highest value of WSN. During ripening, there were significant changes ($p<0.01$) between the groups. The ripening index (RI) was calculated from the ratio of WSN to TN [33]. RI index in cheese increases during ripening due to the breakdown of casein into proteose-peptones [34]. The levels of RI in the cheeses ranged from 6.91 to 25.36%. Variations in the levels of RI detected could be due to age and the action of microbial flora of milk used in the production of the cheeses. RI was shown in Table 1. Kashar cheese with 2% tomato puree gave the highest value. Similar results had also been reported previously [3, 31].

Texture is intrinsically related to the arrangement of various chemical components within distinct micro- and macrostructure levels e.g. protein network or fat fraction. Hardness values of the cheeses generally indicated a rising trend. However, it must be noted that a regular change was not observed in the distribution of monthly analysis which indicated slight decreases in certain cases. The cheeses were produced totally manually. Consequently, the rate of DM of the produced cheeses were not standard as they were expected to be had machines been used in the production. Accordingly, determination of hardness of cheeses showed differences between months. These differences were significant ($p <0.01$).

Lycopene concentration was found 156-168 μg/g in tomato puree. Control Kashar cheese had 0.32 μg/g lycopene, 1% tomato puree with cheese 8.52 μg/g, and 2% tomato puree cheese 19.08 μg/g lycopene in the first day of the experiment (i.e. the 1th day in Table 1). Tomatoes and tomato products are the basic source of lycopene which is very important in nutrition. Although lycopene concentration in cheese initially had low values, this value increased during the ripening period and 90th days had the highest value. The products which show the the higher lycopene levels have the higher antioxidant capacity. It was found that the products which have higher lycopene levels show higher the antioxidant capacity. Accordingly, rates of inhibition increased during maturation. These changes were statistically significant ($p <0.01$).

Antioxidant activity was determined using DPPH method in Kashar cheeses. The inhibition rates of cheeses are shown in Figure 1. Clearly, the antioxidant activities of the lycopene-enriched cheeses were significantly higher when compared to the non-enriched samples ($p<0.01$). Inhibition ratio in the tomato puree cheeses were higher compared to control cheese ($p<0.01$).

Table 1. Chemical composition of cheese samples (mean and standart deviation)

Property	Control				1% Lycopene				2 % Lycopene			
	1th day	30th day	60th day	90th day	1th day	30th day	60th day	90th day	1th day	30thday	60th day	90th day
DM	48.24±10.84	49.75±10.20	50.65±8.13	50.14±9.56	51.22±5.97	52.06±11.38	49.31±6.11	48.48±7.65	50.10±6.21	49.97±8.72	50.79±8.84	50.65±8.82
Salt %	5.65±8.82	2.22±0.66	1.81±1.24	2.11±1.16	3.10±0.74	2.46±0.00	2.40±0.58	2.69±0.33	3.22±0.74	2.69±0.33	2.22±0.33	2.75±0.08
Salt in DM	2.87±1.08	4.89±2.47	3.99±3.32	4.41±3.01	6.44±2.71	4.83±0.56	4.85±2.17	5.46±0.00	6.84±2.61	5.45±1.34	4.58±1.47	5.48±0.79
Fat %	25.25±0.35	25.25±0.35	24.75±0.35	24.00±0.71	25.00±0.71	25.75±0.35	25.50±0.00	25.00±0.71	26.00±0.00	26.50±1.41	25.25±1.06	24.50±1.41
Fat in DM	53.77±12.82	51.79±9.94	49.45±7.26	48.89±10.75	49.06±4.34	50.59±10.41	52.12±6.48	52.33±9.72	52.32±6.47	53.62±6.54	50.33±6.70	48.91±5.75
Lycopene	0.32±0.28^{f}	0.41±0.30^{f}	1.38±0.00^{f}	2.47±1.37^{f}	8.52±0.75^{e}	15.20±1.19^{d}	19.01±0.84^{c}	21.47±1.66^{c}	19.08±0.13^{c}	33.23±1.17^{b}	35.37±0.04^{b}	40.39±2.38^{a}
SH	51.75±0.35^{c}	65.75±3.18^{c}	86.50±7.78^{b}	104.25±4.60^{ab}	57.88±8.31^{c}	65.75±3.18^{c}	87.00±8.49^{b}	105.75±6.72^{ab}	60.50±9.90^{c}	68.00±2.83^{c}	88.00±11.31^{b}	115.50±20.51^{a}
Hardness	18.47±0.77^{cd}	38.05±3.85^{ab}	33.58±6.05^{ab}	32.63±2.04^{b}	16.88±3.41^{d}	44.16±8.61^{a}	28.39±1.41^{bc}	33.96±7.79^{ab}	18.43±7.97^{cd}	36.11±3.58^{ab}	28.13±4.26^{bc}	34.03±7.24^{ab}
Inhibiton %	10.51±4.28^{d}	21.16±2.02^{bc}	18.95±3.42^{c}	25.71±0.77^{ab}	15.37±0.58^{cd}	17.07±3.75^{c}	28.84±2.31^{a}	30.27±4.52^{a}	16.67±0.10^{c}	25.17±0.96^{ab}	28.78±0.87^{a}	30.68±0.29^{a}
TN	7.25±0.25^{ab}	6.83±0.25^{abc}	6.58±0.30^{abcd}	6.23±0.20^{abcd}	7.60±1.24^{a}	7.11±0.15^{ab}	5.50±1.04^{cdef}	5.18±0.69^{def}	6.30±0.10^{abcd}	5.88±0.40^{bcde}	4.59±0.35^{ef}	4.31±0.15^{f}
WSN	0.50±0.03^{de}	0.85±0.05^{abc}	0.81±0.00^{bc}	1.00±0.05^{ab}	0.46±0.03^{de}	0.93±0.00^{abc}	0.85±0.21^{abc}	1.02±0.13^{ab}	0.43±0.08^{e}	0.72±0.03^{cd}	0.91±0.03^{abc}	1.09±0.03^{a}
RI	6.91±0.05^{e}	12.43±1.17^{d}	12.37±0.56^{d}	16.00±0.33^{c}	6.28±1.43^{e}	13.06±0.32^{cd}	15.39±0.91^{cd}	19.65±0.08^{b}	6.69±1.11^{e}	12.31±1.33^{d}	19.79±0.89^{b}	25.36±1.45^{a}

Different small letters depict the statistical difference within a row between time, p<0.05

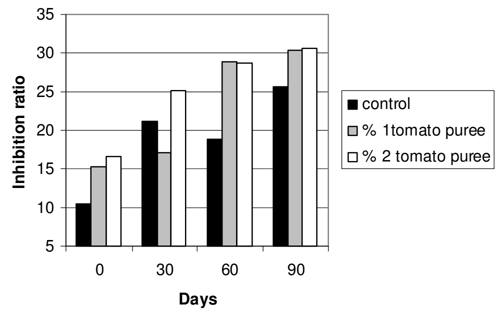

Figure 1. Inhibition ratio % in cheeses during ripening

The results clearly indicate that both cheese enriched with tomato puree enhanced the antioxidant activity. Kashar cheese samples had high antioxidant linked DPPH (free radical) scavenging activity and as expected. DPPH radical scavenging activity was higher in the 2% lycopene cheese compared to control cheese.

Microbiological Analyses

The cell numbers of TMAB, lactic acid bacteria (LAB) and coliforms (Table 2) significantly differed in all cheese samples (p<0.01). TMAB was found to be 4.18-6.52 log cfu/g. The microbiological quality of milk used in cheese making was good and total aerobic bacteria counts varied between 4.07 and 4.70 log cfu/mL in the first day of the experiment. TMAB counts increased constantly during the maturation and reached 5.16-6.35 log cfu/mL. Some researcher had reported higher counts bacteria in Kashar cheese from made raw milk [28, 35].

At ripening period for 60 days of Kashar cheese. TMAB increased at high level. This state was found in Kachkaval cheese samples too [36].Guizani et al. [37] produced Camembert cheese from pasteurized cow's milk and found that total bacteria count were high in cheese throughout the ripening.

LAB plays an important role in the development of required characteristics of dairy products. The LAB counts increased during the ripening period. LAB grown on MRS and M17agar plates were 3.05-6.34 log cfu/mL and 3.77-6.41 log cfu/mL respectively. The result was similar to findings of Akyuz [3]. As expected, for the 60 days of ripening LAB count increased and a slight decrease was noted towards the 90 days of ripening. Tekinsen [4], showed on Kashar cheese that the count of lactic streptococci was reported to decrease from 8.24 log cfu/g to 3.10 log cfu/g after 90 days of ripening.

Coliform bacteria presented a great variability with values in the range of 1.52-4.62 log cfu/mL. As the cheese samples were ripened for increasing number of days, the coliform counts were also increased pro-rata wıth the ripening period. The icrease in bacterial counts may be related to the decrease the salt in DM content of the cheese.

Table 2. Mean counts (log cfu/mL±standard deviation) of microorganisms in cheeses during ripening

Cheese sample	Day	*Lactobacillus* sp.	*Lactococcus* sp.	TMAB	Coliform	Yeast-Mould
Control	1	3.05±0.96^{c}	3.87±0.42^{b}	4.18±0.03^{c}	1.52±1.48^{b}	0.00±0.00^{c}
	30	5.23±1.80^{ab}	5.32±1.44^{ab}	5.41±1.71^{abc}	3.76±0.72^{a}	0.42±0.59^{abc}
	60	6.11±0.41^{a}	6.30±0.06^{a}	5.60±0.29^{abc}	4.62±0.20^{a}	0.12±0.17^{bc}
	90	5.02±1.26^{ab}	4.97±1.84^{ab}	5.16±1.72^{abc}	4.38±1.21^{a}	0.62±0.54^{abc}
1% Tomato puree	1	3.78±0.56^{bc}	4.26±1.23^{b}	4.70±0.88^{bc}	2.74±0.29^{ab}	0.00±0.00^{c}
	30	4.68±0.90^{abc}	4.94±0.71^{ab}	4.88±0.91^{abc}	3.42±1.11^{ab}	0.79±0.44^{abc}
	60	6.34±0.47^{a}	6.36±0.55^{a}	6.52±0.72^{a}	4.11±0.91^{a}	1.12±0.92^{ab}
	90	6.05±0.23^{a}	6.28±0.12^{a}	6.20±0.04^{ab}	4.26±1.27^{a}	0.55±0.11^{abc}
2 % Tomato puree	1	3.53±0.90^{bc}	3.77±0.60^{b}	4.07±0.16^{c}	2.91±1.28^{ab}	0.00±0.00^{c}
	30	5.11±0.46^{ab}	5.40±0.08^{ab}	4.77±0.69^{abc}	4.31±0.11^{a}	1.08±0.86^{ab}
	60	6.16±0.41^{a}	6.29±0.40^{a}	6.37±0.55^{ab}	4.24±1.00^{a}	0.87±0.18^{abc}
	90	6.01±0.10^{a}	6.41±0.38^{a}	6.35±0.40^{ab}	4.44±1.29^{a}	1.39±0.55^{a}

Different small letter depict the statistical difference between time, p<0.05.

Akyüz [3] and Atamer et al. [35] did not isolate coliforms in the experiments on the 30th and 60th day of ripening. This may have been due to the initially low coliform load of milk used as reported by the same authors. The count of yeasts and moulds in the samples were found 0-1.39 log cfu/g. During ripening, their counts were slightly increased because of the contamination. The decreases in yeast and mold counts during the ripening of Kashar were also reported in previous studies [4, 38]. As shown in Table 2, the ripening time significantly (p<0.01) affected the LAB, TMAB counts, yeast, and mould and coliform counts.

Colour Measurements

The analysis of variance identified the significant (p<0.01) effect of ripening time on CIE values of control, 1% and 2% lycopene cheeses (Table 3). Although the* and b* value did not show a definite trend throughout ripening, as the L* value and b* value decreased in the control cheese, b* value of the cheeses with tomato puree increased. Previous research on cheese colour as a function of ripening time by Rohm and Jaros [39] reported decrease of L* value and an increase of a* and b* values during ripening of Emmental cheese. As shown in Table 3, the ripening time significantly affected a* and b* value in between the groups (p<0.01). According to the literature [40, 41], cheese ripening led to a decrease of L* but to an increase of a* and b*; the results were found similar with our results.

Sensory Characteristics

The Kashar cheese made from 1% tomato puree received higher scores in the sensory evaluation. The tomato puree concentration had a statistically significant effect (p<0.01) appearance, odour, taste and the cheese age had significant effects on texture (p<0.01) and total score (p<0.01). After 60 days of ripening, most of the scores for all of the cheese had decreased because of their bitter flavour. Increases in WSN and acidity caused some unfavourable changes in the sensory properties during the ripening period. It is thought that these changes mainly occurred from lactate fermenting yeasts and proteolytic and lipolytic microorganisms which degrade protein and lipids in the cheese [42], the highest average scores were obtained in the cheeses treated with 1% tomato puree being closest to the control group. The addition of 2% tomato puree resulted in a decrease of all sensory parameters.

Table 3. Mean and standard deviation for colour parameters of cheeses made from lycopene and control cheses

Cheese Sample	Days	L*	a*	b*
Control	1	77.30±0.59^{a}	-3.30±0.27^{d}	16.43±1.58^{e}
	30	70.15±0.78^{abc}	-2.70±0.06^{d}	12.11±0.92^{f}
	60	72.15±3.71^{ab}	-2.51±0.31^{d}	12.15±0.36^{f}
	90	71.95±2.74^{ab}	-2.35±0.59^{d}	10.34±0.41^{f}
1% Tomato puree	1	64.97±9.64^{bcd}	14.61±0.29^{bc}	27.86±1.63^{abcd}
	30	62.19±7.57^{cde}	15.47±0.21^{c}	27.84±2.31^{cd}
	60	61.95±2.53^{de}	17.17±0.05^{bc}	31.81±2.14^{ab}
	90	61.10±3.09^{bcde}	17.17±0.05^{bc}	33.64±2.14^{ab}
2 % Tomato puree	1	59.10±5.88^{de}	22.02±0.62^{a}	29.65±2.50^{bcd}
	30	56.85±1.79^{de}	17.12±0.00^{bc}	26.40±2.05^{d}
	60	56.24±1.87^{de}	20.29±1.56^{a}	34.37±0.77^{a}
	90	55.76±2.09^{e}	19.32±3.58^{ab}	35.05±5.51^{abc}

Different small letter depict the statistical difference between time, p<0.05.

CONCLUSION

In this study Kashar cheese produced by tomato puree in different proportions, and physicochemical, microbiological, and sensory properties of these cheese samples were determined. Results of chemical analysis of samples indicated that there were insignificant differences in DM, salt, fat, fat in DM, and salt in DM between the cheese groups. However, lycopene content, the colour value, WSN, TN differed significantly between the groups. It was noted that antioxidant activity of cheese with 2% tomato puree increased more than the others but sensory analysis of cheese with tomato puree 1% more appreciated by the panelists.

According to the results of microbiological assessment, LAB counts, yeast, and mold, TMAB counts changed significantly during ripening. Natural sources of antioxidants in foods enable the development the functional products, give rise to useful products for health, and also contribute to the production of safer foods. For this purpose, the production of Kashar cheese with tomato puree can be more suitable for the industry.

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