



RESEARCH ARTICLE

The properties of kashar cheese produced with added rennet casein

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Rennet kazein ilave edilerek üretilmiş kaşar peynirinin özellikleri

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Öz

Amaç: Değişik oranlarda rennet kazein eklenerek üretilen kaşar peynirlerinin olgunlaşma süresince kimyasal, mikrobiyolojik ve duyuşal özelliklerinde meydana gelen değişimin araştırılması amaçlanmıştır.

Gereç ve Yöntem: Sütün yağı %3,0'e ayarlandı, 37°C'ye ısıtılıp enzim eklendi. Pıhtı işleme, baskılama ve fermentasyondan sonra parçalama işleminde eritme tuzları (%0,1), kaya tuzu (%1,5) ve rennet kazein (%0-kontrol, 0,5, 1,0, 1,5, 2,0) eklendi. Eritme işlemi (65°C, 5 dak) yapılarak peynir üretildi, vakumla paketlenildi, olgunlaştırıldı (8°C, 90 gün). Örneklerde kuru madde gravimetrik yöntemle, yağ Gerber metoduyla, tuz Mohr yöntemiyle ve titrasyon asitliği % laktik asit olarak belirlendi. Örneklerin Toplam mezofilik aerobik bakteri, laktik asit bakterisi, Stapylococcus aureus, koliform bakteri, maya-küf içeriği incelendi. Duyusal değerlendirme 7 panelist tarafından yapıldı. Kimyasal ve mikrobiyolojik sonuçlar istatistiksel olarak one-way Anova testine, duyuşal sonuçlar ise Kruskal-Wallis H testine tabi tutuldu.

Bulgular: Peynirler 8°C'de 90 gün olgunlaştırıldı ve olgunlaştırmanın 1., 30., 60. ve 90. günlerinde kimyasal, mikrobiyolojik ve duyuşal analizler yapıldı. Peynirlerin ortalama pH değerleri 5,62-5,76, asitlik %0,55-0,83 L.a., kurumadde %54,93-58,04, tuz %1,22-1,37, kurumaddede tuz %2,21-2,45, yağ %23,67-25,33 ve kurumaddede yağ %41,20-45,46, TAMB 5,17-5,75 logkbf/g, LAB 5,49-6,98 logkbf/g, maya-küf sayısı 3,66-4,88 logkbf/g olarak belirlendi, S.aureus ve koliform grubu bakteriyeye rastlanılmadı. Peynirlerin titrasyon asitliğinde önemli farklılık bulundu (p<0,05), fakat diğer kriterlerde fark tespit edilmedi (p>0,05). Duyusal analizlerde dış görünüş bakımından 3 nolu peynirde, iç görünüş bakımından 2 nolu peynirde istatistiki olarak önemli farklılık bulundu (p<0,05).

Öneri: Kaşar peyniri üretiminde rennet kazein eklenerek üretim yapılabileceği ve olgunlaşma sağlanabileceği söylenebilir.

Anahtar kelimeler: Analog peynir, kaşar peyniri, rennet kazein, kalite özellikleri

Abstract

Aim: It was aimed to investigate the changes in the chemical, microbiological and sensory properties of kashar cheese produced by adding different rates of rennet casein during ripening.

Materials and Methods: Bovine milk (3,0% fat) was heated (37°C), enzyme was added. After clotting, pressure and fermentation, emulsifying salts (0,1%), salt (1,5%) and rennet casein (%0-control, 0,5, 1,0, 1,5, 2,0) was added. Produced cheese at melting tank (65°C, 5 min) was packaged and was ripened (8°C, 90 days). In samples, dry matter was conducted with gravimetric, fat with Gerber, salt with Mohr and titration acidity with % lactic acidity. Total mesophilic aerobic bacteria, lactic acid bacteria, S.aureus, coliform bacteria, yeast-mould contents of the samples were examined. Sensory evaluation was performed by 7 panelists. One-way Anova test and Kruskal-Wallis H test was used for statistically analysis.

Results: Cheeses were ripened at 8°C and were analyzed during the ripening period (90 days). pH value was found between 5,62-5,76, acidity 0,55-0,83L.a., drymatter 54,93-58,04%, salt 1,22-1,37%, salt in drymatter 2,21-2,45%, fat 23,67-25,33% and fat in drymatter 41,20-45,46%. Mean values were determined to TAMB 5,17-5,75 logcfu/g, LAB 5,49-6,98 logcfu/g, mould-yeast 3,66-4,88 logcfu/g. There was a significant difference (p<0,05) on titratable acidity and pH of the cheeses, but no difference (p> 0,05) was found on other criteria. Total scores were between 20,62-22,19 point at sensory evaluation. In the sensory analysis, 3rd group cheese in terms of external appearance and 2nd group cheese in terms of internal appearance statistically have significant difference (p <0,05).

Conclusion: In the production of kashar cheese, it can be stated that production can be made and ripening can be achieved by adding rennet casein.

Keywords: Cheese analogues, kashar cheese, rennet casein, quality characteristics





Introduction

It is supposed that there are about 2000 kinds of cheese in the world (Tekinşen 2000). More than 130 varieties of cheese produced locally are being produced in Turkey (Kamber 2015). After white cheese, kashar is the most manufactured cheese in Turkey (Hayaloğlu 2009, Anonymous 2018). Cow, sheep, goat, buffalo milk or mixture of them is used to produce kashar cheese. Milk is pasteurized with its technique and can be enriched by some additives. Kashar cheese has a typical taste, flavour, colour and smell. Kashar cheese described as ripen kashar or fresh kashar can be consumed unripe (fresh) or ripen (old). According to its fat rate, there are three types of kashar cheese as low-fat cheese, fat cheese and whole-fat cheese. Similar to Kaskaval, Provolone, Caciocavallo, Regusono, and Mozzarella, Kashar cheese is classified as “pasta-filata cheese” (Anonymous 2006, Yalman et al 2017, Yuvaşen et al 2018). Kashar cheese is produced in two ways: (i) traditional method – scalding of the curd, (ii) modern method – processed cheese technology (Çetin-kaya and Atasever 2015, Yalman et al 2017).

Two main types of casein have been produced and named according to coagulation agents to benefit from the functional properties of it in various fields of industry. Types of casein: (i) rennet casein, (ii) acid casein. Rennet casein is produced through the coagulation of rennet from skim milk at 30°C. As in the case of cheese production, the casein miscella is firstly made into gel, afterwards the whey is separated from the formed casein, washed with water and then dried and ground. Casein and caseinates are biopolymer powders produced from milk and they are used in food, paper, textile and leather industry and in many other sectors. In the food industry, they are incorporated to some food composition as an additive. The use of casein in dairy production, texture, viscosity, water binding capacity, emulsifying, foaming characteristic of the products are regulated (Fox 2000, Stathopoulos 2008, Jacop et al 2010, Badem and Ucar 2017).

Cheese analogue, a cheese-like type of cheese, is manufactured using ingredients such as milk, milk fat, protein, vegetable-based substances, etc. in the presence of emulsifying salts (ES) with the influence of mechanic and thermal energy. ES are important ingredients in cheesemaking because of heat treatment of “oiling off”. ES contains citrates and phosphates used for processed cheese (Badem and Ucar 2016, Jana et al 2017, Yalman et al 2017).

Microbiota of cheese has an important effect on characteristics of cheese variety as a crucial and critical in the ripening period. Non-starter lactic acid bacteria (NSLAB) surrounding the environment has a major effect for development of cheese ripening. NSLAB forms the majority of the cheese population during ripening if starter culture is not added to cheese (Beresford et al 2001). In the present study, it was aimed to determine the effect of rennet casein on chemical, microbiological and sensory quality in Kashar cheese.

Materials and Methods

Cheese production

Raw bovine milk (3,0% fat) was heated to 37°C and enzyme (chymosin) was added. After clotting, pressure and fermentation, the curd was separated into five equal pieces and then rennet casein was added in the rate of 0,5% (group 1), 1,0% (group 2), 1,5% (group 3) 2,0% (group 4) and 0% (group 5-control), respectively. For each g of casein 4 g water, 0,1% emulsifying salts (Kasomel™ - K1112, K2185, K3112, K3172; mixing rate: 1/1/1/1; including E331, E339, E452) and 1,5% salt was added by calculating the amount of clot. Curd was processed for 5 min, at 65°C in the melting tank and product was stored at 22°C, for 1 day. Then it was packaged by vacuuming and ripened at 8°C, for 90 days. The Kashar cheese production was performed without using starter culture. The study has been repeated three times.

Analysis of the cheese samples

In the five group samples, contents of the cheeses were determined by Gravimetric method, Gerber method, Mohr method for dry matter, fat, salt, respectively. Titratable acidity was determined as lactic acid. pH was measured with a pH meter (Nell) (Anonymous 2000). PCA (Oxoid, UK), MRS (LabM, UK), BPA (bioMérieux, France), VRBA (LabM), DRBC (Merck, Germany) were used to analyze TAMB, LAB, *Staphylococcus aureus*, coliform bacteria group, yeast-mould counts, respectively. Coagulase test (staphylase test; bioMérieux, France) was performed to identify *S. aureus*. Coagulase-(+) samples were verified by VITEK II (bioMérieux) (Anonymous 2001). Sensory evaluation was performed by 7 trained panelist using the 5-point hedonic method (Anonymous 2006). One-way Anova test was used for chemical and microbiological results statistical analysis, and Kruskal-Wallis H test was used to evaluate sensory analysis in SPSS 21.0 program.

Results

The chemical analysis data obtained in the study was given in Table 1. According to the results of chemical analysis, pH values of kashar cheese were determined between 5,56-5,77 and titratable acidity values between 0,53-0,83% L.A. Significant differences ($p<0,05$) were found in the 3rd and 5th cheese sample groups in terms of acidity during ripening period. Besides, there were differences between groups in cheese samples on the 60th day ($p<0,05$).

The microbiological analysis data obtained in the study was given in Table 2. According to the data obtained through microbiological count, TAMB counts were found between 4,67-6,25 log cfu/g. Any coliform bacteria or *S.aureus* was not detected. The sensory analysis data obtained in the study was given in Table 3. Total sensory evaluation scores given for each cheese sample were between 20,62-22,19. Cheese samples,



Table 1. Chemical parameters determined from the kashar cheese produced with different rates of rennet casein during the storage period (n=3)

		Cheese groups					F
	Day	1	2	3	4	5	
pH	1	5.77±0.13	5.71±0.12	5.70±0.12	5.68±0.15	5.66±0.12	0.11
	30	5.76±0.10	5.73±0.11	5.61±0.20	5.61±0.19	5.65±0.69	0.23
	60	5.59±0.11b	5.59±0.01b	5.57±0.03b	5.56±0.02b	5.76±0.04a	10.29*
	90	5.67±0.01	5.66±0.03	5.65±0.05	5.64±0.02	5.62±0.05	0.27
	F	1.05	0.53	0.22	0.18	0.59	
Acidity (% L.A.)	1	0.70±0.05	0.69±0.12	0.78±0.10X	0.74±0.08	0.83±0.11X	0.37
	30	0.61±0.12	0.56±0.07	0.53±0.08Y	0.57±0.07	0.55±0.06Y	0.13
	60	0.72±0.03	0.71±0.05	0.71±0.02XY	0.73±0.05	0.72±0.03XY	0.08
	90	0.74±0.08	0.71±0.04	0.70±0.04XY	0.69±0.07	0.73±0.07XY	0.11
	F	0.54	0.90	2.22*	1.30	2.57*	
Dry Matter (DM) (%)	1	58.12±1.65	57.15±0.96	57.69±0.84	58.43±1.47	58.04±1.15	0.15
	30	58.04±1.20	56.72±2.29	57.51±1.82	58.56±2.77	55.72±1.37	0.32
	60	56.09±0.57	55.83±1.15	56.01±1.23	56.22±1.11	54.93±1.10	0.24
	90	59.30±1.55	56.84±0.96	57.28±1.34	59.04±2.74	57.53±1.39	0.42
	F	1.03	0.15	0.31	0.34	1.36	
Salt (%)	1	1.57±0.08	1.32±0.12	1.41±0.08	1.43±0.07	1.28±0.13	1.32
	30	1.44±0.08	1.39±0.10	1.40±0.10	1.39±0.10	1.37±0.09	0.09
	60	1.66±0.01	1.37±0.10	1.38±0.11	1.48±0.01	1.22±0.09	4.28
	90	1.52±0.04	1.29±0.11	1.45±0.08	1.47±0.06	1.34±0.01	1.79
	F	2.32	0.19	0.09	0.34	0.53	
Salt in DM (%)	1	2.70±0.10	2.31±0.22	2.46±0.16	2.46±0.19	2.22±0.27	0.88
	30	2.48±0.08	2.46±0.13	2.43±0.14	2.37±0.13	2.45±0.11	0.11
	60	2.96±0.06	2.44±0.13	2.45±0.15	2.63±0.36	2.21±0.12	6.50
	90	2.56±0.01	2.27±0.19	2.52±0.15	2.50±0.16	2.32±0.07	0.94
	F	8.61	0.29	0.07	0.60	0.50	
Fat (%)	1	25.33±1.20	25.67±1.33	26.33±0.67	26.67±0.88	25.33±1.67	0.25
	30	25.50±1.26	25.00±1.00	25.67±1.20	25.33±1.33	25.33±0.88	0.05
	60	24.67±1.45	27.33±0.33	24.67±1.45	24.67±1.45	23.67±0.88	1.31
	90	23.67±0.88	23.67±0.88	24.67±1.45	24.67±1.45	23.67±0.88	0.23
	F	0.47	2.54	0.44	0.53	0.73	
Fat in DM (%)	1	43.73±2.96	44.89±2.01	45.65±0.98	45.64±1.09	43.10±3.13	0.27
	30	43.86±1.67	44.25±2.76	44.67±2.04	43.45±2.96	45.46±0.90	0.12
	60	43.95±2.28	49.02±1.62	43.97±1.68	43.81±1.83	43.06±0.78	1.99
	90	40.04±2.50	41.64±1.45	43.07±2.48	41.92±2.94	41.20±2.04	0.22
	F	0.63	2.27	0.34	0.42	0.79	

*significant (p<0.05).

1:0.5% rennet casein, 2:1.0% rennet casein, 3:1.5% rennet casein, 4:2.0% rennet casein, 5:0% rennet casein.

a,b,c: values shown with different letters in the same line was different at the level of p<0,05.

X,Y,Z: values shown with different letters in the same column was different at the level of p<0.05.

which were considered to exterior-appearance and interior-appearance, just statistical differences (p<0,05) were determined for 3rd and 2nd cheese samples, respectively.

Discussions

Guinee and Fox (1993) stated that the fluctuation at pH val-

ues are the result of buffering of compounds formed by large molecule proteins' degradation with acidity and proteolysis after microbial activity. They also stated that rennet casein caused buffering capacity increase and had an important effect on the titratable acidity. Yangilar (2017) has stated pH value between 5,05-5,31 and titratable acidity between 1,22-2,82% L.A. of control cheese samples produced without





Table 2. Microbiological analysis data determined from the kashar cheese produced with different rates of rennet casein during the storage period (log cfu/g) (n=3)

		Cheese groups					F
	Day	1	2	3	4	5	
TAMB	1	4,89±0,55	4,88±0,50	4,79±0,56	4,67±0,55	5,18±0,59	0,12
	30	5,83±0,49	5,57±0,39	5,37±0,24	5,37±0,32	5,17±0,24	0,51
	60	5,41±0,27	5,68±0,36	5,71±0,31	5,66±0,42	5,75±0,65	0,10
	90	5,96±0,25	5,83±0,13	5,72±0,16	6,25±0,16	5,71±0,29	1,14
	F	1,38	1,30	1,54	2,87	0,47	
LAB	1	5,39±0,35	5,79±0,34	4,99±0,47	5,52±0,42	5,49±0,48	0,48
	30	6,41±0,58	6,04±0,98	5,79±1,10	5,73±1,21	5,95±1,05	0,07
	60	6,87±0,33	7,03±0,25	7,15±0,22	7,25±0,30	6,98±0,31	0,27
	90	5,49±0,30	5,39±0,35	5,76±0,27	6,28±0,54	5,64±0,16	1,00
	F	3,13	1,54	2,08	1,17	1,23	
Yeast- mould	1	4,22±0,27	4,15±0,19	3,95±0,33	3,94±0,06	4,26±0,01	0,50
	30	4,63±0,28	4,39±0,72	4,48±0,27	4,25±0,42	4,43±0,20	0,26
	60	4,14±0,27	4,51±0,00	4,33±0,38	4,52±0,61	4,88±0,45	0,47
	90	4,20±0,10	4,32±0,32	4,07±1,06	4,42±0,21	3,66±0,83	0,24
	F	0,85	2,19	0,16	0,43	1,10	

1:0.5% rennet casein, 2:1.0% rennet casein, 3:1.5% rennet casein, 4:2.0% rennet casein, 5:0% rennet casein.

a,b,c: values shown with different letters in the same line was different at the level of $p<0,05$.X,Y,Z: values shown with different letters in the same column was different at the level of $p<0,05$.

using starter culture while Çetinkaya and Atasever (2015) has determined that pH value 5,02-5,39 and titratable acidity 0,19-0,70% L.A. The other researchers (Tunçtürk et al 2010, Temiz 2010, Sert et al 2007), have determined to pH/ titratable acidity (%L.A.) 5,18-5,47/0,56-0,96; -/0,38-0,40; 4,91-5,40/-, respectively. The mean values of the cheeses on dry matter, fat, fat in dry matter, salt, salt in dry matter were found between 54,93-59,04%; 23,67-26,67%; 40,04-49,02%, 1,22-1,66%; 2,21-2,96%, respectively. No significant differences ($p>0,05$) were found on dry matter, fat and salt content. Some researchers (Tunçtürk et al 2010, Temiz 2010, Sert et al 2007, Çetinkaya and Atasever 2015, Yangilar 2017) determined dry matter (%), salt (%), salt in dry matter (%), fat (%), fat in dry matter (%), 59,70-67,95, 1,54-3,48, -, 31,00-36,75, 51,56-57,29; 53,53-53,84, 1,52-1,58, -, 23,00-23,06, -; 50,52-59,54, 2,21-3,27, -, 22,50-25,50, -; 53,09-65,14, -, 4,51-6,77, -, 42,36-49,28; 59,17-64,48, 2,22-4,74, -, 24,06-31,33, -, respectively. Yalman et al (2017) have studied three type cheese (kashar, processed kashar and cheese analogue). They have reported that dry matter, fat, salt were found between 50,68%, 21,50%, 1,16% at kashar, 48,75%, 24,00%, 0,89% at processed, 50,74%, 29,75%, 0,87% at cheese analogue, respectively. They stated that among the cheeses in terms of fat, significant differences ($p<0,05$) were experienced, but no significant differences ($p>0,05$) in dry matter and salt content of the cheeses were stated. They have also found that pH, titratable acidity 5,07-5,63, 0,35-0,52% at kashar, 5,80-6,03, 0,43-1,33% at processed, 6,37-7,39, 0,41-0,51% at cheese analogue, respectively. They have demonstrated that there are significant interaction between

cheese type and storage time with regard to titratable acidity and pH. Kashar cheese's pH values was significantly ($p<0,05$) lower than the others during the ripening period for 90 days.

TAMB count found between 4,67-6,25 log cfu/g and first day was less than the other studies (Nizamlioğlu et al 1996, Atasever et al 2003, Çetinkaya and Soyutemiz 2006, Sert et al 2007, Temiz 2010 and Tunçtürk et al 2010). TAMB counts were similar to on the other days. On the other hand Yangilar (2017) found TAMB count 7,04-8,28 log cfu/g and Çetinkaya and Atasever (2015) determined TAMB count 6,90-8,20 log cfu/g. The high pH values were related to the lack of starter cultures and the number of microorganisms in the raw milks which was used cheese production confirmed by Üçüncü (2005). According to the data obtained through microbiological count, LAB counts were between 5,39-7,25 log cfu/g. Lactobacilli activity is faster on account of nutrient abundance, low acid concentration and high water activity at the starting of the ripening period. Because of microbial activity, the water amount decreases in the environment of cheese, salt and acidity concentration increase, and LAB count decreases in the end the ripening period (Çetinkaya and Soyutemiz 2006, Tunçtürk et al 2010). NSLAB becomes dominant and the microorganism numbers can reach 107-108 cfu/g in the ripening period in cheese (Fox and Cogan 2004). NSLAB's proteinases and peptidases are usually parallel to LAB and contribute to ripening as parallel buffering (Upadhyay et al 2004). LAB counts are similar to Çetinkaya and Atasever (2015) but Yangilar (2017) results are higher than this study (6,09-7,87 log cfu/g). The microflora, where domi-



Table 3. Sensory evaluation results determined from the kashar cheese produced with different rates of rennet casein during the storage period

		Cheese groups					F
		1	2	3	4	5	
Exterior Appearance	Day						
	1	4,48±0,18	4,33±0,23	4,38±0,16	4,52±0,11	4,48±0,18	0,944
	30	4,29±0,16	4,33±0,13	3,95±0,18	4,38±0,13	4,24±0,18	0,423
	60	4,33±0,17	4,33±0,17	4,24±0,21	4,38±0,15	4,43±0,13	0,995
	90	4,19±0,16	4,10±0,27	4,62±0,13	4,33±0,17	4,29±0,23	0,401
Interior Appearance	F	0,502	0,817	0,027*	0,891	0,712	
	1	4,38±0,19	4,52±0,19	4,52±0,13	4,48±0,18	4,52±0,16	0,918
	30	4,33±0,16	3,86±0,20	4,29±0,14	4,33±0,13	4,10±0,14	0,245
	60	4,14±0,22	4,33±0,13	4,10±0,18	4,24±0,19	4,33±0,16	0,900
	90	4,14±0,17	4,05±0,16	4,38±0,16	4,29±0,14	4,24±0,19	0,564
Texture	F	0,655	0,027*	0,284	0,558	0,180	
	1	4,29±0,20	4,33±0,17	4,24±0,17	4,29±0,16	4,24±0,21	0,985
	30	4,24±0,12	4,14±0,10	4,24±0,17	4,33±0,16	4,14±0,17	0,775
	60	4,10±0,18	4,14±0,16	4,19±0,21	4,29±0,14	4,33±0,13	0,876
	90	4,33±0,17	4,05±0,18	4,43±0,13	4,24±0,14	4,29±0,16	0,557
Flavour	F	0,629	0,564	0,868	0,947	0,887	
	1	4,57±0,16	4,52±0,13	4,29±0,18	4,29±0,17	4,48±0,16	0,577
	30	4,57±0,13	4,43±0,16	4,24±0,17	4,43±0,15	4,38±0,16	0,676
	60	4,33±0,20	4,29±0,20	4,43±0,16	4,38±0,18	4,57±0,11	0,929
	90	4,52±0,13	4,43±0,18	4,57±0,13	4,57±0,13	4,48±0,21	0,974
Taste	F	0,678	0,895	0,469	0,694	0,784	
	1	4,29±0,18	4,19±0,16	4,24±0,18	4,19±0,15	4,48±0,15	0,638
	30	4,43±0,15	4,33±0,16	3,95±0,18	4,19±0,19	4,29±0,18	0,361
	60	4,29±0,16	3,95±0,22	4,19±0,18	4,14±0,16	4,52±0,13	0,286
	90	4,24±0,14	4,00±0,24	4,48±0,15	4,43±0,13	4,29±0,21	0,552
Total	F	0,774	0,672	0,166	0,597	0,849	
	1	22,00±0,72	21,90±0,66	21,67±0,54	21,76±0,54	22,19±0,68	0,696
	30	21,86±0,44	21,10±0,53	20,67±0,72	21,67±0,56	21,14±0,67	0,733
	60	21,19±0,80	21,05±0,70	21,14±0,77	21,43±0,58	22,19±0,48	0,826
	90	21,43±0,53	20,62±0,85	22,48±0,53	21,86±0,53	21,57±0,88	0,415
	F	0,619	0,589	0,185	0,954	0,521	

*significant (p<0.05).

1:0.5% rennet casein, 2:1.0% rennet casein, 3:1.5% rennet casein, 4:2.0% rennet casein, 5:0% rennet casein.

a,b,c: values shown with different letters in the same line was different at the level of p<0,05.

X,Y,Z: values shown with different letters in the same column was different at the level of p<0.05.

nant microbial groups are lactobacilli and lactococci, were very important during kashar cheese ripening (Aydemir et al 2015). Besides, lactobacilli, especially *L. paracasei*, dominates kashar cheese LAB microflora (Yuvaşen et al 2018). According to the data obtained through microbiological count, yeast-mould counts were between 3,66-4,88 log cfu/g. Also, yeast-mould counts were found less at the study of Çetinkaya and Atasever (2015) and Yangilar (2017), 1,56-4,06, 1,00-4,63 log cfu/g, respectively. But, Sert et al (2007) has announced 0-0,54 log cfu/g. NSLAB is responsible for cheese ripening (Yuvaşen et al 2018). The place where the cheese is made, and even the dairy plant, determines the cheese microflora. While the number of lactobacilli or yeast-mould

reaches 4,35-7,84/1,09-3,81 log cfu/g in one dairy plant, this numbers are 2,36-3,43/1,30-5,06 log cfu/g in the other. Yeast-mould counts should be controlled for cheese quality (Jurado and Ruiz-Navarro 2018).

Yalman et al (2017) detected significant differences (p<0,01) among the cheeses with regard to flavor, no significant differences among the cheeses on account of texture and appearance (p>0,05). Sert et al (2007) were observed no differences (p>0,05) in cheese flavor, significant differences (p<0,01) in point of appearance while Yaşar and Güzeler (2011) were observed significant (p<0,01) differences on account of flavor, texture and appearance (p<0,05). Besides, Tarakci and





Kucukoner (2006) were experienced no differences ($p>0,05$) in the cheeses in terms of appearance, texture, flavor and acceptability. Temiz (2010) were observed no differences ($p>0,05$) in the cheeses in terms of appearance and flavor, too.

Conclusions

Due to the different rennet casein addition rates and the buffering capacity of the proteins, an important difference with regard to titration acidity and pH has been experienced ($p<0,05$) between cheese groups. Eventhough starter culture was not used in the manufacture of kashar cheese and desired kashar cheese was produced with 2,0% rennet casein. In the sensory evaluation, it was concluded that the panelists could not use negative evaluations on rennet casein and that rennet casein could be used in the production of kashar cheese like cheese analogues production on account of its inclusion in the milk. New studies are needed to obtain better measure on the effect of very small quantities of rennet casein on the sensory quality of kashar cheese.

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