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Full Length Research Paper

Some chemical properties of Karin Kaymagi cheese samples produced in dairy plant

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In this study, the effects of different packaging materials such as artificial case, barrel and tripe on chemical properties of Karin Kaymagi cheese were investigated. In this research, four different Karin Kaymagi cheese samples were prepared from white cheese, civil cheese, when cheese, pasteurized cream and concentrated yogurt mixes. It was found that samples in barrel had the lowest dry matter ratio. The dry matter ratio of samples in artificial case was the highest among all samples. The protein ratios changed when dry matter ratios changed. M2 and M3 mixes had the highest water soluble protein ratio (wspr). The wspr of M1 and M4 mixes was the lowest. The samples in tripe (original packaging material of the cheese) had the highest ripening degree (36.39%), the lowest ripening degree (21.30%) was found in samples in artificial case. As ripening periods increased the acidity (SH), lipolysis and proteolysis degree of samples increased too.

Keywords: Karin Kaymagi cheese, tripe, ripening degree and lipolysis.

INTRODUCTION

Cheese is an important integral part of Turkish diet. The variety of cheese depends on certain factors: cultural habits and tastes, natural conditions, the species and variety of the animals providing the milk and the production methods employed (Yılmaz and others, 2005). Although there are about 50 different kinds of cheese produced in Turkey. But, only Beyaz (white), Kashar and Tulum cheese types are produced in all regions of Turkey (Anonymous 2000). Many traditional cheeses are produced and consumed locally such as Karin Kaymagi cheese, a special cheese in Turkey, is widely produced in Sarıkamış, Oltu and Kars regions of Turkey. After the ripening period, Karin Kaymagi cheese has a characteristically natural taste and flavour. The flavour is described as piquant and mildly acidic. Also ripened Karin Kaymagi cheese is consumed by most people in Turkey.

The making technique of this cheese can be transferred to dairy plants. Thus, cheeses with standard quality and composition can be produced in all regions of Turkey. In almost all parts of Turkey, cheese is produced from raw and heat-treated ewes' milk or a blend of cows' and ewes' milk and mostly from cow's milk (Akın and others 2003). A series of chemical and biochemical changes occur during cheese ripening including glycolysis, lipolysis and most importantly proteolysis (Ong and others 2007). The aroma in processed cheese is influenced by many factors, from inherent properties of the milk to technological choices in production (Sunesen and others, 2002).

In the traditional production of Karin Kaymagi cheese making, Beyaz cheese or Civil cheese is mixed with cream (butter), whey cheese and yogurt. Then, mix is salted at 2-3% ratio. Mixture is filled to cleaned artificial case (abomasum) unless hole and pressed 3 days. Cheeses are ripened at 5-10^{o}C for 60-90 days. The chemical composition of Karin Kaymagi cheese has been reviewed by limited research (Cakmakci and others 1995). The objective of this study was to investigate the effect of different mixes and packaging materials (artificial case, barrel and tripe) on chemical properties of Karin Kaymagi cheese during ripening.

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MATERIALS AND METHODS

Materials

In this research, cow milk was used for the sample production of Karin Kaymagi cheese. One part of the milk was defatted and non fat milk was processed to Civil cheese. In the production of Civil cheese, defatted milk was acidified to 20°SH. Then, milk was heated to 32°C and added to rennet 1 ml for 100 L milk. The temperature of milk was raised to 55°C. Then, the civil cheese particles were collected with a stainless steel stick. The cream was pasteurized at 75°C for 30 minute. The second part of milk was standardized to 3% butterfat and processed to Beyaz cheese curd. The whey which obtained from Beyaz cheese production was processed to whey cheese. Third lots of milk were standardized to 3% butterfat and processed to yogurt. Then, yogurt was drained in cloth to get concentrated yogurt. The Beyaz cheese and yogurt production were made with standard production techniques (Demirci and Simsek, 1997)

Preparation of Karin Kaymagi cheese samples:

The procedures for producing the various Karin Kaymagi cheese samples were:

Cheese (M1)

Beyaz cheese fragments (80%), whey cheese (10%) and pasteurised cream (10%) were mixed. Then mixes were filled to packaging materials (tripe, barrel and artificial case).

Cheese (M2)

Beyaz cheese fragments (80%), concentrated yogurt (10%) and cream (%10) were mixed and filled to packaging materials.

Cheese (M3)

Civil cheese pieces (80%), whey cheese (10%) and pasteurised cream (10%) were mixed. Then mixes were filled to packaging materials.

Cheese (M4)

Civil cheese pieces (80%), concentrated yogurt (10%) and cream (%10) were mixed and filled to packaging materials.

All cheese samples were ripened at 12 °C (relative humidity 85%) for 2, 15, 30 and 60 days.

Chemical Analysis Methods

Dry matter, protein, water soluble protein (wspr), ripening degree and titretable acidity (SH) were carried out according to the methods by Kurt and others (1996). Lipolysis was measured as Acid Degree Value (ADV). 10g of ground cheese samples were placed in a special butyrometer. 20 ml of BDI reagent were added (pH: 6.6) and butyrometers were placed in boiling water both for 20 min for liberate the fat. The mixture was centrifuged for 1 min. and methanol was added into the bottle. Then, the fraction of liquid fat was transferred into the flask and weighed. 5 ml fat solvent was added into the flask. Titration was done with 0.02 N KOH (Salji and Kroger 1981). Proteolitic activity of Karin Kaymagi cheese was determined by the methods of Citti and others (1963). 5 g cheese samples were mixed with 1 ml of water and 10 ml of 0.72 N TCA and hold in room temperature. Then, mixes was filtrated and the 5 ml of samples were mixed with Na_2CO_3 and $Na_4P_2O_7$. The samples with blue colour were centrifuged at 5000 rpm for 15 min. The absorbance of clear phase was measured by spectrometer.

Statistical analysis

All statistical analysis was performed on a computer running SAS for windows. Analysis of variance was performed using the routine Proc ANOVA. Significant treatment was separated using Duncan's multiple range test (Düzgünes et al., 1987).

RESULTS AND DISCUSSION

The chemical composition of the milk, filtration yogurt, curd, cream, Civil cheese and White cheese curd is given on Table 1. The mean chemical and physical composition (dry matter, fat, fat in dry matter, ash, salt, salt in dry matter, acidity, protein and pH) analysis data obtained from the experimental Karin Kaymagi cheeses are presented in Table 2. The results of the chemical analysis (water-soluble protein ratio, ripening degree, lipolysis and tyrosine content) of Karin Kaymagi cheese are shown in Table 3.

According to the analysis of variance results, it was seen that the samples in artificial case had the highest dry matter ratio, because of water lose from artificial case. The samples in barrel had the lowest ratio. As ripening periods increased, the dry matter ratio of samples increased too ($P<0.01$). Cakmakci and others (1995) found that Karin Kaymagi samples contained average 69.10% dry matter. The ratio was higher than of our findings. This can stem from the components used in the production making and ripening situation of Karin Kaymagi cheese.

The protein ratio of M3 mix was higher than other mixtures. The samples in artificial case had the highest protein ratio. This situation occurred due to the fact that

Table 1.The chemical composition of the milk, filtration yogurt, curd, cream, Civil cheese and White cheese curd.

Samples	Dry matter (%)	Fat (%)	Fat in Dry matter (%)	Ash (%)	Salt (%)	Salt in Dry matter (%)	Titratable acidity (SH)	pH	Protein (%)
M1	51.77 ^{b}	20.08^{b}	39.01^{b}	6.61^{a}	5.43^{b}	10.77^{b}		5.77^{A}	19.61^{c}
M2	50.13^{c}	14.97^{c}	29.94^{c}	5.29^{b}	5.48^{b}	11.45^{a}		5.46^{B}	22.07^{b}
M3	52.96^{a}	9.75^{d}	18.42^{d}	5.03^{c}	5.68^{a}	11.14^{ab}		5.68^{AB}	30.04^{a}
M4	52.64^{a}	22.46^{a}	43.28^{a}	6.56^{a}	5.11^{c}	9.78^{c}		5.81^{A}	18.51^{d}
Storage time (Day)									
2	40.36^{d}	13.67^{d}	33.94^{a}	5.52^{b}	5.52^{b}	13.59^{a}	42.44^{c}	5.82^{a}	16.63^{d}
15	48.68^{c}	15.93^{c}	32.87^{a}	4.53^{c}	4.53^{c}	9.61^{c}	63.99^{b}	5.66^{b}	20.23^{c}
30	55.97^{b}	16.82^{b}	30.06^{b}	5.34^{b}	5.34^{b}	9.66^{c}	73.95^{a}	5.67^{b}	25.34^{b}
60	61.99^{a}	20.83^{a}	33.78^{a}	6.90^{a}	6.31^{a}	10.27^{b}	76.32^{a}	5.57^{c}	28.03^{a}
Source	**ANNOVA**								
Sample (S)	xx	xx	xx	xx	Xx	Xx	NS	x	Xx
Storage period (SP)	xx	xx	xx	xx	Xx	Xx	Xx	x	Xx
SxSP	xx	xx	xx	xx	Xx	Xx	Xx	x	Xx

Means with same letters within the same column are not significant at P > 0.05.
Statistical significance between samples of Karin Kaymagi cheese: *P<0.05, **P<0.01 and NS: non significant

Table 2. The chemical and physical composition analysis of Karin Kaymagi cheeses.

Analyses	Milk	Filtration yogurt	Curd	Cream	Civil cheese	White curd	Cheese
Drymatter(%)	11.67	21.64	29.05	71.61	36.89	41.62	
Fat (%)	3.2		6	70.00	3.5	15.6	
Ash (%)	0.67	1.781	2.15	—	2.985	5.16	
Acidity(SH)	7.548	39.16	30.48	15.98	23.97	58.40	
pH	—	3.65	5.64	4.29	4.95	5.90	

cheese, yogurt and curd was present in the mixture at the different amounts, and that water filtration of artificial case was high. As ripening periods increased, the protein ratios increased too. Cakmakci and others (1995) found that the average protein ratio of Karin Kaymagi cheese was 19.01%. The results were lower than our result. The salt in cheese influences cheese ripening through its effect on water activity. The salt concentration influence proteolysis of cheese various enzyme activities. Lower salt content increased acid production as proteolysis increases (Mistry and Kasperson, 1998). The percentages of salt in this study were significant (P<0.01).

Salt ratio of M3 mix was found to be higher than the other samples significantly (P<0.01). The salt ratio of the samples packed in artificial case was also higher than the other packing materials. The salt ratios found by Cakmakci and others (1995) in the samples of Karin Kaymagi cheese, in the filled cheese found by Çaglar and others (1998) and in the Çerkez cheese found by Uysal and others (1998) are parallel to the results of this study.

According to the analysis of variance results, it was found that M2 and M3 mixes had the highest water soluble protein ratio. The samples packaged in artificial case had the lowest wspr. The dry matter ratio of samples in artificial case was higher than the others. This case can be a reason for the lowest wspr of samples. As ripening periods increased, the wspr increased too. The wspr results (3.77%) found by Cakmakci and others (1995) were parallel to our results. M2 mix had the highest ripening degree. The ripening degree of cheese samples in tripe was higher than that the other samples. Ripening degree decreased during ripening process for 15 days, but it increased until 30 th and 60 th days. Cakmakci and others 1995) found that Karin Kaymagi cheese samples had average 9.27% ripening degree. The degree found by Cakmakci and others (1995) was lower than our findings. The pH of the cheeses reduced significantly (P<0.01) after 60 days of ripening at 12^{o}C. The pH values ranged from 4.76 to 6.77.

The acidity was found to be at the highest level in the samples packaged in the tripe (66.03 SH). In addition, the increase in the acidity as the ripening time increased was

Table 3. The results of the chemical analysis of Karin Kaymagi cheese.

Samples	WSPR (%)	Ripening Degree (%)	Lipolysis (%)	Tyrosine content
M1	4.59^{b}	23.60^{d}	1.44^{B}	1.05^{a}
M2	8.11^{a}	37.05^{a}	1.52^{AB}	0.91^{c}
M3	8.00^{a}	33.12^{b}	1.73^{AB}	0.98^{c}
M4	4.73^{b}	27.27^{c}	1.85^{A}	1.01^{b}
Storage time (Day)				
2	3.87^{d}	30.53^{b}	0.92^{c}	0.57^{d}
15	5.09^{c}	26.35^{c}	1.29^{c}	0.76^{c}
30	7.31^{b}	30.55^{c}	1.85^{b}	1.09^{b}
60	9.15^{a}	33.62^{a}	2.48^{a}	1.53^{a}
Source	**ANNOVA**			
Sample (S)	Xx	Xx	x	xx
Storage period (SP)	Xx	Xx	xx	xx
SxSP	Xx	Xx	NS	x

Means with same letters within the same column are not significant at P > 0.05.
Statistical significance between samples of Karin Kaymagi cheese: *P<0.05, **P<0.01 and NS: non significant

found to be significant (p<0.01). The average acidity degree (% 1.01) found by Cakmakci and others (1995) in Karin Kaymagi cheese samples were lower than the findings of this research study. The lipolysis degree of M4 cheese mix was higher than other mixtures. The cheese samples packaged in barrel had the highest lipolysis degree. This case resulted from the higher water ratio of samples packaged in barrel. As ripening periods increased, the lipolysis degree of samples increased significantly (p<0.01). This case can result from higher water ratio of samples in barrel (Table 1). The average tyrosine amount of Tulum cheese was found to be 1.51mg/g by Güler and Uraz (2004). Bakirci and Andic (1999) found that the lipolysis degree of Çeçil cheese samples was 1.86 ADV in average. Those findings were parallel to our findings.

CONCLUSIONS

It was found that tripe (abomasum) is the ideal packaging material. The cheese samples in artificial case were lost higher amount of the water of cheese. But, samples in barrel lost water at significant level. For this reason, artificial case and barrel were not accepted as good packaging materials for Karin Kaymagi cheese. It was found that tripe can preserve the Karin Kaymagi cheese better than the others. The higher and lower water permeability of packaging materials was the reason for the undesired variations at chemical properties of cheese samples. The protein ratios changed while dry matter ratios changed. M2 and M3 mixes had the highest water soluble protein ratio (wspr), the wspr of M1 and M4 mixes were the lowest. The samples in tripe (original packaging material of the cheese) had the highest ripening degree (36.39%), the lowest ripening degree (21.30%) was found in samples in artificial case. As ripening periods increased, the acidity (SH), lipolysis and proteolysis degree of samples were increased too. Ripened Karin Kaymagi cheese is consumed by most people in Turkey. The production technique of this cheese can be applied at dairy plants. Thus cheese with standard quality and composition can be produced.

The chemical analysis of all cheese samples in this study showed that the utilization of the tripe packaging in Karin Kaymagi cheese production has no adverse effects on cheese composition.

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