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Annals of Biological Research, 2013, 4 (10):67-70
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Effect of different types of milk on some physicochemical and sensory characteristics of Iranian white brined cheese

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ABSTRACT

This study was conducted to determine some physicochemical (Protein, Fat, Total Solids, Salt, pH and Acidity)% and sensory characteristics (Flavor, Body and Texture, Appearance and Color, and Acceptability) of Iranian white brined cheese which made from different types of milk (sheep's, cow's or mixture of two) during ripening period (5, 30, 60 and 90 days). Ripening periods had a significant effect ($P < 0.05$) on some traits including; Protein, Fat, Total Solids, Salt, pH, Acidity and Flavor except for Body & Texture, Appearance & Color and acceptability. All physicochemical properties except for acidity and salt decreased but all sensory properties increased during ripening periods. Totally the results showed that cheeses made from sheep's milk had the best quality among all treatments.

Keywords: Iranian white brined cheese, physicochemical characteristics, Sensory properties, milk

INTRODUCTION

In Iran, white brined cheese is a major item in the diet and the consumption per capita per annum is about 5.4 kg. At the industrial level, the ripening time is about 45-90 days [1]. In general, large quantities of sheep milk and a part of goat and cow milk are used for the production of a traditional white brined cheese. It is well known that white brined cheese has gained popularity and international recognition. White brined cheese can be produced using caprine or ovine or bovine milk alone or any mixture of them [2]. Therefore, quantities of goat's or cow's milk that are not utilized in other ways can be used for the production of Iranian white brined cheese. Traditionally, Iranian white brined cheese is made from non-pasteurized milk in small family premises with basic equipment. White brined cheese, like other types of ripened cheese, requires maturation to develop the required sensory properties. In warm climates it is necessary to preserve cheeses in brine [3]. The specific characteristics of brine cheese develop in the salted water and chemical, physical and sensorial properties of this type of cheese are controlled by processing and environmental conditions [4]. The chemical components of a cheese are derived from milk components and non-cheese milk ingredients such as cultures and enzymes. The diversity of chemical components is determined by ripening agents such as endogenous milk enzymes, milk coagulants, added proteases and lipases, enzyme systems of both starter and non-starter bacteria and other microflora [5]. Hence, the aim of the present study was to determine effect of types of milk and sensory characteristics of Iranian white brined cheese. We supposed that types of milk used for cheese making influenced physicochemical and sensory characteristics of Iranian white brined cheese.

MATERIALS AND METHODS

Cheese making

Ewe's milk from the Zandy breed was supplied from a farm in Varamin. Experimental cheese samples were made in three replications at the Tehran Pegah dairy plant (Tehran, Iran). Lighvan cheese was produced using raw milk. The raw milk was warmed to 36 °C, and coagulated with microbial rennet for 60 minutes. After curdling, the curd was

cut into cubes of approximately 1 cm³ and left to rest for 15 minutes. The slab curd was placed on a mesh table and weighted for draining. After whey separation was completed, the curd was cut into large cubes (approximately 10×10×7 cm) and immersed in brine with 22% concentration for about seven hours at room temperature. The cheese blocks were placed into a tin-plate container with brine salted to about a 12% concentration. The container was sealed and stored for 90 days [2].

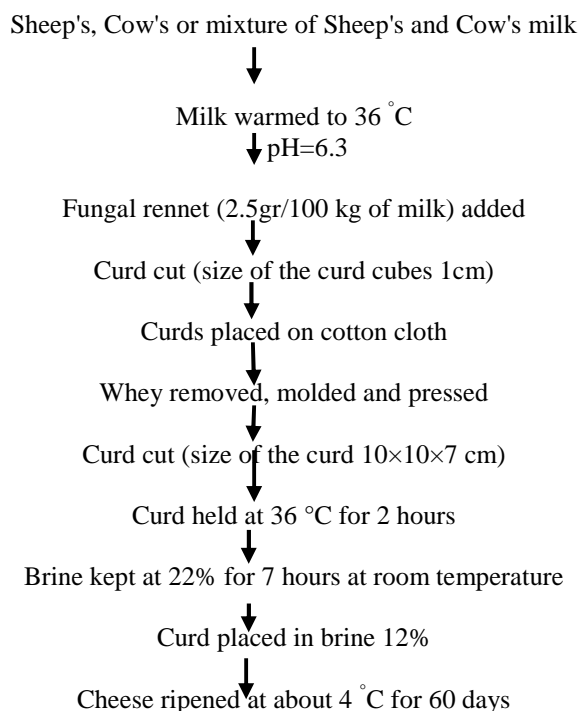


Figure 1. Protocol for the production of Iranian white brine cheese

Chemical analysis

Samples of cheese were analyzed for pH (Metrohm Model 632 pH-meter; Switzerland) and percentages of titratable acidity, protein, total solids, total fat and salt after 5, 30, 60 and 90 days of ripening [6].

Sensory characteristic

Sensory characteristic of the cheese after 5, 30, 60 and 90 days of ripening was carried out by a five-member trained panel to judge sensory evaluation of Lighvan cheese. The samples were presented to panelists in randomized order after having stood for 2 h at room temperature and were graded between 1 and 10 (1 being very bad and 10 being very good) for appearance and color, body and texture, and flavor and acceptability [7]. Panel members were also instructed to report any defects in appearance, body and texture, flavor and acceptability. Water was provided for mouth washing between evaluations of samples.

Statistical analysis

The data were statistically analyzed using a completely randomized design (CRD) with three replications. Data were subjected to analysis of variance using the SAS statistical software package [8]. Mean comparison was performed with LSD's test at the $P < 0.05$ level of significance.

RESULTS AND DISCUSSION

Mean values for protein, fat, total solids, salt, titratable acidity and pH throughout the ripening of Iranian white brined cheese samples are presented in table 1. According to statistical analysis, all the above mentioned parameters were significantly affected by the ripening period ($P < 0.05$). Protein content of the different cheese samples, which was initially between 14.9% and 15.81%, decreased during ripening and was between 9.87% and 11.52% at the end of 90 days. Decreases in protein content of Iranian white brine cheeses throughout ripening was attributed to proteolysis activities, because proteolysis in Iranian white brined cheese continues during storage in brine. This results shows that there was stronger proteinase activity throughout ripening in Iranian white brined cheese. Similar results were obtained by others who studied yeasts as ripening adjunct cultures in Turkish white brined cheese [9].

Total fat content of the cheese samples was between 13.55% and 15.7% and decreased gradually during ripening and was between 8% and 13.15% at the end of 90 days. Changes in fat content could be due to a decrease in total solids and lipolytic activity. Similar results were obtained by others [9].

Total solid content of the different cheese samples, which was initially between 36.5% and 40.15% decreased during ripening and was between 34.5% and 36.2% at the end of 90 days. Decreases in total solid content of brined cheeses throughout ripening generally originate from water soluble proteins and peptides passed from the cheese matrix to brine [10]. Furthermore, new ionic groups formed by the break down of peptides and the elevated water absorbing ability of proteins during cold storage can decrease the total solid content in cheese [11].

A marked increase was observed in salt content during first month of ripening period in all samples ($P<0.05$) and the highest salt content was noted in sample produced with sheep's milk during this period (3.66%-4.90%). Increase in salt content during ripening could be attributed to the large gradient concentration between curd and brine at first month of ripening period.

Titrate acidity of the sample increased throughout ripening, while pH values decreased ($P<0.05$). Samples produced from sheep's milk had the highest acidity (16%-18%) and lowest pH (6.32-6.25) values at the end of ripening. The decrease in pH during the 90 days of curd preservation in brine is due mainly to completion of the lactose fermentation and the liberation of amino and free fatty acids following proteolysis and lipolysis [1].

Table 1. Physicochemical characteristic (g 100 g⁻¹) of Iranian white brined cheese^{B,C} made with different types of milk

Days of ripening	Treatments ^A	Physicochemical parameters					
		Protein (%)	Fat (%)	Total solid (%)	Salt (%)	pH	Titrate acidity (%)
5	S	15.81 ^a ±0.07	15.70 ^a ±0.05	40.15 ^a ±0.075	3.66 ^a ±0.02	6.32 ^a ±0.1	16.00 ^a ±0.15
	C	14.90 ^b ±0.1	13.55 ^b ±0.035	36.50 ^b ±0.04	3.07 ^b ±0.04	6.44 ^b ±0.01	11.00 ^b ±0.15
	M	15.36 ^c ±0.05	14.70 ^c ±0.075	38.70 ^c ±0.025	3.36 ^c ±0.05	6.38 ^c ±0.01	13.50 ^c ±0.2
30	S	14.66 ^d ±0.07	14.85 ^d ±0.02	38.85 ^d ±0.05	4.85 ^d ±0.025	6.30 ^d ±0.005	16.50 ^d ±0.2
	C	13.70 ^e ±0.075	11.75 ^e ±0.125	35.80 ^e ±0.06	4.65 ^e ±0.035	6.39 ^e ±0.005	13.10 ^e ±0.2
	M	14.22 ^f ±0.115	13.44 ^f ±0.105	37.35 ^f ±0.045	4.72 ^f ±0.035	6.36 ^f ±0.01	14.30 ^f ±0.2
60	S	12.95 ^g ±0.125	14.00 ^g ±0.1	37.50 ^g ±0.06	4.88 ^g ±0.02	6.29 ^g ±0.005	17.20 ^g ±0.3
	C	11.40 ^h ±0.12	9.90 ^h ±0.05	35.20 ^h ±0.025	4.69 ^h ±0.04	6.34 ^h ±0.005	15.10 ^h ±0.2
	M	12.21 ⁱ ±0.08	12.02 ⁱ ±0.08	36.42 ⁱ ±0.035	4.75 ⁱ ±0.025	6.32 ⁱ ±0.01	16.00 ⁱ ±0.25
90	S	11.52 ^j ±0.115	13.15 ^j ±0.05	36.20 ^j ±0.025	4.90 ^j ±0.025	6.25 ^j ±0.01	18.00 ^j ±0.2
	C	9.82 ^k ±0.925	8.00 ^k ±0.35	34.50 ^k ±0.02	4.70 ^k ±0.05	6.31 ^k ±0.01	16.20 ^k ±0.15
	M	10.72 ^m ±0.095	10.45 ^m ±0.035	35.73 ^m ±0.02	4.78 ^m ±0.025	6.28 ^m ±0.01	17.00 ^m ±0.25

^B Means in each row with a superscript differ significantly ($P<0.05$).

^C Means of three trials±S.E.

^A Cheese: S; produced from sheep's milk; C, produced from cow's milk; M, produced from mixture of sheep's and cow's milk.

Table 2. Sensory characteristics scores of Iranian white brined cheese^{B,C} made with different types of milk

Days of ripening	Treatment ^A	Sensory characteristics scores			
		Flavor	Body & texture	Appearance & color	Acceptability
5	S	6.45 ^a ±0.05	7.05±0.05	6.75±0.05	7.05±0.05
	C	6.30 ^b ±0.1	6.80±0.1	6.65±0.05	6.65±0.05
	M	6.40 ^c ±0.1	6.90±0.1	6.75±0.05	6.85±0.05
30	S	7.55 ^d ±0.05	7.60±0.1	7.05±0.05	7.35±0.05
	C	6.75 ^e ±0.15	7.10±0.1	7.05±0.05	6.95±0.05
	M	6.95 ^f ±0.05	7.15±0.05	7.05±0.05	7.05±0.05
60	S	8.10 ^g ±0.1	8.10±0.1	7.45±0.05	7.85±0.05
	C	6.90 ^h ±0.1	7.50±0.1	7.35±0.05	7.15±0.05
	M	7.55 ⁱ ±0.1	7.80±0.1	7.35±0.05	7.60±0.1
90	S	8.40 ^k ±0.1	8.50±0.1	7.65±0.05	7.95±0.05
	C	7.10 ^j ±0.1	7.80±0.1	7.55±0.05	7.45±0.05
	M	8.10 ^m ±0.1	8.05±0.05	7.55±0.05	7.75±0.05

^B Means in each row with a superscript differ significantly ($P<0.05$) and means in each row without a superscript did not differ significantly ($P>0.05$).

^C Means of three trials±S.E.

^A Cheese: S; produced from sheep's milk; C, produced from cow's milk; M, produced from mixture of sheep's and cow's milk.

Sensory characteristics

The sensory characteristics of Iranian white brined cheeses made from different types of milk are shown in table 2. Statistical analysis showed that types of milk used in all cheese samples had no significance effect ($P>0.05$) on sensory characteristics except for flavor. All the characteristics scores increased during storage. A similar result was reported by others [12]. The highest values were observed at 90 days and the lowest values at 5 days of storage. The increase in the value of flavor was attributed to be completed of ripening period by glycolysis, lipolysis and

proteolysis processes. Flavor, appearance and color, body and texture, acceptability scores increased generally during ripening. The scores for cheese made from sheep's milk were slightly higher than cow's milk or mixture of cow's and sheep's milk. Because panelists preferred cheese than other cheeses made from different types of milk. The reason why panelists liked cheeses made from sheep's milk was it's to be perceive properties more taste, texture, color and appearance.

CONCLUSION

It was observed that different types of milk had a significant effect on some physicochemical of Iranian white brined cheese. The protein, fat, total solid and pH decreased during maturation but salt and titratable acidity increased. Sensorial properties of samples increased during ripening. Appearance and color, body and texture, flavor, acceptability properties of Iranian white brined cheese made from sheep's milk were more preferred compared with samples made from cow's milk or mixture of cow's and sheep's milk. Finally we concluded that sheep's milk used in Iranian white brined cheese as well as nutritional value can increase consumption of brined cheese throughout the countries because it has better sensory characteristics than other different types of cheeses.

Acknowledgments

We would like to thank MAD Laboratory for technical assistances.

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