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MANUFACTURING OF INDIGENOUS CHEESE USING STARTER CULTURE AND DIRECT ACIDIFICATION PROCESS

Izhar H. Athar, Tariq Masud and Amanat Ali

Animal Sciences Institute, National Agricultural Research Centre, Islamabad

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Direct acidification process (DAP) starter culture process (SCP) were used to manufacture indigenous cheese. The trials were carried out with seven replicates using cow, buffalo and *buffalo toned milk. The results indicated that there was no significant difference among the constituents of cheese and whey obtained by DAP and SCP in all three types of milk. Organoleptic tests showed that cheese prepared by DAP was more acceptable as compared to SCP.

Key words: Indigenous, Cheese, Acidification.

INTRODUCTION

Cheese is full of essential nutrients and is one of the oldest foods of mankind. Indigenous cheese made by primitive methods at small scale in Pakistan is primarily by acid coagulation. In North West Frontier Province indigenous cheese is particularly used as an ingredient for cooking with meat and vegetables [1]. A typical local product was produced by using buffalo milk, coagulated with rennet at 36° and after 70-90 minutes the curd was broken up and whey was drained. Curd so obtained was brined for 3-4 days to produce acceptable aroma [2]. Covacevich [3] compared direct chemical acidification (DCA) as well as starter culture process (SCP) for the production of various types of cheese. The (DCA) has also been used traditionally in Latin America for the production of white cheese (Queso Blanco) and recently for ricotta cheese [4]. In the present study the direct acidification process (DAP) and starter culture process (SCP) as described by Kosikowski [5] were used to prepare cheese from cow milk, buffalo milk and buffalo toned milk with an aim to improve the technique of indigenous cheese making in the country.

MATERIALS AND METHODS

Direct acidification process (DAP). Four litres of milk was taken in a stainless steel container and heated to 85° for 15 minutes. Milk was cooled down to 60° and then coagulated with a 10 percent *citric acid solution. The coagulant was added slowly with agitation at the rate of 22 ml/litre of milk. The curd so obtained was allowed to settle for 5 minutes. The whey was drained off and curd was salted at the rate of 1.5 percent by weight of curd. The curd was then moulded and pressed for 2-3 hours at room temperature

(25°). Cheese was removed from mould, weighed, sampled and stored at 4° for further evaluation.

Starter culture process (SCP). Four litres of pasteurized (62° for 30 minutes) milk was taken in a stainless steel sanitized container. Before adding the 3% starter culture the temperature of milk was brought to 32°. The liquid **rennet was added at the rate of 0.15ml/litre of milk after half an hour and mixed thoroughly. The coagulum so obtained was cut and scalding was done by gradually raising the temperature of the curd to 38° within 30 minutes. After cooking of the curd, the steps of manufacture of cheese were identical to those described previously under direct acidification process.

Each sample of milk, cheese and whey was analysed for total solids, total protein, fat and ash by official methods of analysis [6]. Curd protein was determined in accordance with the procedure of Mickelson [7]. Lactose content was determined by difference. Cheese was evaluated by a panel of 25 judges on hedonic scale 1-10 for flavour/taste and body/texture and given score for each attribute of the sample. Statistical analysis of the data was carried out by least square analysis of variance for three factors (milk type, manufacturing process and replication) design experiment [8].

RESULTS AND DISCUSSION

Milk composition. The average chemical composition of different types of milk used in this study is given (Table 1).

The results indicated (Table 1), that there was no statistically significant difference in the total solids and fat contents of cows and buffalo toned milk. However, there was significant differences ($P < 0.05$) in total solids and fat contents of buffalo milk as compared to cow's and buffalo toned milk. No significant differences was observed in the

+Milk made by adding skim milk powder and water to buffalo Milk to reduce the fat upto standardized milk.

*Commercial food grade.

*Isolated and propagated in Dairy Technology Lab. (ASI) from indigenous yoghurt (Dahi).

**Calf Rennet Extract Marshall Division, Miles Laboratories Madison Wi.

total protein and ash contents of all the three types of milk. Although slightly higher values for lactose in buffalo toned milk were observed but the differences were not significant.

Cheese composition. Average chemical composition of cheese prepared in this study is presented in (Table 2).

Table 1. ^aAverage chemical composition of different types of milk used for cheese manufacturing.

Constituents	Cow milk	Buff. milk	Buff. toned milk	Mean	^b SE ±
Total solids(%)	12.6 ^c	16.1 ^d	12.6 ^c	13.76	0.16
Fat (%)	4.2 ^c	7.1 ^d	3.5 ^c	4.93	0.17
SNF (%)	8.4 ^d	9.0 ^c	9.1 ^c	8.83	0.11
Total protein (%)	3.3 ^c	3.6 ^c	3.4 ^c	3.43	0.09
Lactose (%)	4.4 ^c	4.7 ^c	4.9 ^c	4.67	0.10
Ash (%)	0.72 ^c	0.74 ^c	0.71 ^c	0.72	0.00

Table 2. ^aAverage chemical composition of cheese manufactured from three types of milk.

Constituents	Cow Milk		Buff. milk		Buff. toned milk			*SE ±
	DAP	SCP	DAP	SCP	DAP	SCP	Mean	
Total solids (%)	48.73 ^a	48.21 ^a	49.43 ^a	52.04 ^a	48.00 ^a	46.50 ^a	48.82	0.72
Fat (%)	22.46 ^a	22.71 ^a	28.86 ^a	29.14 ^a	18.86 ^a	18.14 ^a	23.36	0.67
Moisture (%)	51.27 ^a	51.79 ^a	50.07 ^a	47.96 ^a	52.00 ^a	53.50 ^a	51.10	0.72
Total protein (%)	21.23 ^a	20.92 ^a	16.07 ^a	17.84 ^a	24.29 ^a	23.82 ^a	20.69	0.64
Lactose (%)	2.52 ^a	2.32 ^a	2.33 ^a	2.58 ^a	2.52 ^a	2.28 ^a	2.43	0.09
Ash	2.53 ^a	2.36 ^a	2.67 ^a	2.48 ^a	2.34 ^a	2.40 ^a	2.46	0.05

Table 3. ^aAverage chemical composition of whey resulting from the manufacture use cheese from three types of milk.

Constituents	Cow Milk		Buff. milk		Buff. toned milk			*SE ±
	DAP	SCP	DAP	SCP	DAP	SCP	Mean	
Total solids (%)	7.58 ^a	8.17 ^a	7.44 ^a	8.14 ^a	7.31 ^a	7.52 ^a	7.69	0.09
Fat (%)	1.13 ^a	1.32 ^a	1.11 ^a	1.13 ^a	0.54 ^a	0.60 ^a	0.97	0.06
Moisture (%)	92.42 ^a	91.82 ^a	92.54 ^a	91.88 ^a	92.69 ^a	92.48 ^a	92.31	0.23
Total protein (%)	0.45 ^a	0.88 ^a	0.86 ^a	1.27 ^a	0.96 ^a	1.08 ^a	0.92	0.08
Lactose (%)	5.37 ^a	5.29 ^a	4.82 ^a	5.11 ^a	5.17 ^a	5.25 ^a	5.17	0.02
Ash	0.63 ^a	0.66 ^a	0.65 ^a	0.63 ^a	0.64 ^a	0.58 ^a	0.68	0.01

a: of 7 replications.

b: standard error.

c,c: same superscripts do not differ from each other (Horizontal rows)

c,d: different superscripts differ ($P < 0.05$) (Horizontal rows).

The results indicated (Table 2) that no statistically significant differences were observed between chemical composition of cheese prepared by the processes of DAP and SCP. While comparing the cheeses obtained from cow milk, buffalo milk and buffalo toned milk, the cheese obtained from buffalo milk contained more total solids, fat and total protein and the differences were significant ($P < 0.05$). Because the buffalo milk had more total solids, fat and total protein contents as compared to others. Such vari-

ation of the contents of milk usually account for variation of cheese as reported in earlier study [9]. No significant difference was found in ash and lactose contents of cheese obtained from three types of milk utilized in this study.

Whey composition. The chemical composition of whey is presented in Table 3.

The results of composition showed that whey obtained from buffalo toned milk contained the lowest fat contents 0.57% as compared to whey from cow milk and buffalo milk. The total protein contents of whey from cow milk were the lowest and the difference were statistically significant ($P < 0.05$). There was no significant difference in lactose and ash contents of whey obtained from all three types of milk in both the processes. The whey obtained in SCP contained slightly higher amount of total solids as compared to whey from DAP. This slight increase in the total solids contents of whey obtained in SCP may be attributed to fat and total protein contents of SCP whey. Higher solids in whey can be either an advantageous or disadvantageous to the cheese manufacturing technology depending upon the utilization of whey [4, 5].

Organoleptic evaluation of cheese. The panel results indicated that the cheese prepared by DAP was liked more as compared to SCP. The preference recorded was 70% in case of cheese prepared by DAP and 30% in case of cheese obtained using SCP. The panel results further revealed that cheese made from cow milk by DAP was given more preference on the basis of flavour and body/texture as compared to cheese obtained from other milk. The results are in line with findings of earlier study [10].

On the basis of results obtained in this study, it is concluded that procedure of indigenous cheese preparation in the country can be improved through employing exact heat treatment dose of coagulant and other manufacturing techniques mentioned in this study.

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Five different chemicals, were used as such, as well as in mixtures of varying combinations for testing the relative efficacy as preservatives on twenty different sheep and goat skin pieces. Each sample of skin was taken from 24 hours' soaked, well washed, free of salt piece of salted stock. This was incubated at 37° for a week, to activate the microbial flora, checking the effectivity of the applied preservatives. Results were calculated on the basis of % weight loss of the skin.

(1) Boric acid 0.2% wt. basis (2) Na-benzoate 0.2% wt. basis (3) Neomycin 0.1% wt. basis (4) Common salt 2.5% wt. basis

All these chemicals were used separately or as mixtures. Total twenty skin pieces were tested for preservation. Ten pieces each of sheep and goat. The effectivity was calculated on the basis of percent weight loss of skin, i.e. of hide substance, after incubation at 37° for one week, then at room temp. Afterwards this was done for varying lengths of time. The purpose of the incubation of the experimental skin pieces in an incubator at 37° was to activate the microbial flora, then checking the effectivity of the applied preservatives.

Table I. Chemicals and its percentages of preservatives applied on sheep and goat skins.

No.	Preservative offered on the wt. of skin	Offered (%)	Code No. (sheep)	Code No. (goat)
1	Common salt	2.5	G ₁	G ₁
2	Boric acid	0.2	G ₂	G ₂
3	Sodium benzoate	0.2	G ₃	G ₃
4	Neomycin	0.1	G ₄	G ₄
5	Boric acid and common salt	2.5	G ₅	G ₅
6	Sodium benzoate and common salt	2.5	G ₆	G ₆
7	Neomycin and common salt	2.5	G ₇	G ₇
8	Boric acid and sodium benzoate	1.0	G ₈	G ₈
9	Sodium benzoate and neomycin	0.6	G ₉	G ₉
10	Boric acid and neomycin	0.6	G ₁₀	G ₁₀

The raw hide and skin being an ideal environment for microbial growth, the danger of putrefaction during drying can be greatly reduced by salting. Although plantain and sheep, may contain traces of metals or other impurities, which can impart stains on the hides and skins. Sometimes pathogenic microbes causing defects. Keeping in view the defects associated with preservation by salting, work on other preservatives is undertaken in many parts of the world. This includes both long term and short term preservation techniques.

INTRODUCTION

Any deterioration of skin before or during curing is of irreversible nature, poorly cured skin will not produce the highest quality leather, regardless of the tanners' care or skill [1].

A system for short term preservation of hides that might be used in slaughter houses to produce acceptable side upper leather has been proposed [2]. The method preserves hides for about 7 days, and involves treatment with sodium sulfite and acetic acid.

A 20% soda ash solution used for preserving raw cattle hides has been reported [3]. There was neither slippage nor bad odor during the storage period.

Pig skin samples treated with a 20% lot of 1% sodium bisulfite and 1% acetic acid could be preserved for 28 days at 30° based on control of microbial numbers and protease activity [4].

No such work has been reported in earlier in Pakistan.

MATERIALS AND METHODS

For testing the effectivity of various preservatives, two different skin samples of sheep and goat were taken. The chemicals used as preservatives were:-