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MANUFACTURING OF INDIGENOUS CHEESE USING STARTER CULTURE AND DIRECT ACIDIFICATION PROCESS

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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 Balanco) 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 pannel 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 skimmilk powder and water to buffalo Milk to reduce the fat upto standardized milk.

*Commercial food grade.

*Isolated and propagated in Dairy Technololgy 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.[a]Average chemical composition of different types of milk used for cheese manufacturing.

Constituents	Cow milk	Buff. milk	Buff. tonned 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. [a]Average chemical composition of cheese manufactured from three types of milk.

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

Table 3. [a]Average chemical compoistion of whey resulting from the manufacture use cheese from three types of milk.

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

a: of 7 replications.
b: standard error.
c,c: same supercripts do not differ from each other (Horizontal rows)
c,d: different supercripts 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 variation 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 pannel 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 pannel 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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