

The Influence of Different Coagulants on Yield and Sensory Quality of Cow Milk Chhana

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ABSTRACT

An investigation was undertaken to study the effects of different coagulants citric acid, lactic acid (1 %, 2% & 3%) and lemon juice (lemon juice: distilled water 1:0, 1:5 and 1:10) on sensory quality, percent yield and fat & total solids recovery of chhana. The colour and overall acceptability of chhana made with 1 % citric acid and 2 % lactic acid recorded significantly higher scores. There was significantly highest score for body and texture of chhana made with 1 % and 2 % lactic acid. Chhana made with lemon juice in different concentrations recorded significantly lower sensory scores for all attributes. Chhana prepared by using 1% citric acid recorded significantly highest yield followed by 2 % lactic acid. Further, the fat and total solids recoveries were significantly higher in chhana made with citric acid and lactic acid. Highest fat and total solids recovery was recorded in the chhana made by using 1 % citric acid and 2 % lactic acid. Lemon juice as a coagulant lowered the yield, fat and total solids recovery significantly. On the basis of observations it is concluded that good quality cow milk chhana with optimum yield, total solids recovery and sensory quality could be obtained by coagulating milk with 1 % citric acid and 2 % lactic acid.

Kew words: Cow Milk, Chhana, Citric Acid, Lactic Acid, Sensory Quality, Yield and Recovery;

Milk and milk products have enjoyed the well-known position in the Indian food. Among Indian milk products, khoa and chhana based milk sweets handel about 10% of total Indian milk production. An estimated 50-55% of milk produced in India is converted into a variety of traditional milk products using process like heat acid coagulation, heat desiccation, fermentation etc. Chhana is a heat and acid coagulated milk product of India. It is being used as a base product for preparation of different varieties of Indian delicacies like chum-chum, sandesh, pantoha, rajbhog and chhana podo (Mandal, 1977) etc. These sweets vary widely in composition and their shelf life and packaging are not up to the desired level. These milk based sweets are available throughout the country in all seasons. Khoa based sweets are popular in northern India where as chhana based sweets are preferred by the population of eastern India. Generally cow milk is used for chhana making as it yields fine, compact, close knit and smooth texture with velvety body, which is highly desirable for different chhana based products. High calcium content, different protein

make up, higher total solids and curd tension of buffalo milk as compared with cow milk results in harder and coarse chhana. Therefore, a study was undertaken in order to find out suitable concentration of different coagulants to make best quality cow milk chhana.

METHODOLOGY

Milk: Fresh cow milk was procured from the livestock unit of COVSc, Parbhani.

Coagulants: Citric acid, lactic acid and lemon juice were used in different concentrations for preparation of chhana.

Chhana making: Chhana was prepared from standardized cow milk (4 % fat) as per the method described by De (1980). Milk was divided into different lots as per the treatment. Each lot of milk was heated to boiling and subsequently cooled to 80 °C. Different coagulants viz. citric acid and lactic acid were tried @ 1 per cent, 2 per cent and 3 per cent while lemon juice was used by diluting with distilled water in different ratios viz. 1:0, 1:5 and 1:10. Coagulants were heated to 80°C and slowly added to the milk with continuous stirring till

complete coagulation occurred and the clear whey was observed. The coagulated mass was kept undisturbed for 02 min. and then transferred to muslin cloth for drainage of whey. After 20 min. the chhana obtained from each lot was collected and weighed.

Chemical analysis: Total solid and moisture content of chhana was determined by standard gravimetric method (IS: SP: 18, 1981) for milk. Fat content in cow milk and chhana were determined by Gerber's method (IS: SP: 18, 1981) for milk. Total protein and ash content of chhana were determined according to methods of AOAC (1995).

Per cent yield of chhana: The yield of chhana obtained from each lot of cow milk using different coagulants was recorded to calculate the percent recovery of the product.

Sensory quality: The samples of chhana were evaluated by a panel of 6 judges for flavour, body and texture, colour, appearance and overall acceptability on 9 point hedonic scale suggested by Amerine *et al.* (1965).

Data analysis: The data were subjected to analysis of variance using Completely Randomized Design and standard deviation was computed as described by Snedecor and Cochran (1989).

RESULT AND DISCUSSION

Effect of coagulants on the sensory quality of chhana: The Effect of different coagulants citric acid, lactic acid and lemon juice on sensory quality of chhana is presented in Table 1. The sensory quality scores for all the attributes of chhana made by using coagulants in different concentrations differed significantly. The colour and overall acceptability of chhana made with 1 percent citric acid and 2 percent lactic acid recorded significantly

higher scores as compared to other concentration and coagulants. Score for body & texture was significantly highest for the product made with 1 percent and 2 percent lactic acid followed by 1 percent citric acid. Similar findings were also reported by Singh and Ray (1977) and Joshi *et al.* (1991). The chhana made with 1 percent citric acid and 2 percent lactic acid did not differ significantly for flavour score. It is further observed that with increase in strength of citric acid, flavour scores declined sharply. This indicates that increased concentration of citric acid or lactic acid (3 percent) was not suitable for preparation of chhana since it produced a product with acidic flavour. These observations are in agreement with Ahmed *et al.* (1982) who reported that acceptability of chhana decreased with increasing strength of citric acid as a coagulant. Lemon juice used as coagulant in different concentrations recorded significantly lower scores but use of lemon juice in decreased concentrations enhanced the flavour and overall acceptability scores of the product.

Effect of Different Coagulants on Yield, Fat and Total Solids Recovery of Chhana: Percent yield, fat and total solids recovery of chhana as influenced by coagulants is presented in Table 2. The yield of chhana from cow milk differed significantly due to coagulants added in different concentrations. Chhana prepared by using 1 per cent citric acid as coagulant recorded significantly highest yield (16.45 %) followed by 2 per cent lactic acid (16.41 %). Further, increase in strength of citric acid from 1 to 3 per cent, resulted in declined the yield of chhana but the differences were observed to be marginal. Similar trend was recorded when lactic acid was used as coagulant wherein the yield was

Table 1: Effect of different coagulants on sensory quality of chhana

Coagulant	Concentration	Colour & appearance	Body & texture	Flavour	Overall acceptability
Citric acid	1%	8.24a	7.78b	8.14a	8.02a
	2%	8.04ab	7.72c	7.56b	7.60b
	3%	7.9 c	7.44c	7.44bc	7.42b
Lactic acid	1%	8.02b	8.24a	7.84ab	7.76ab
	2%	8.28a	8.32a	8.00ab	8.06a
	3%	7.92bc	7.30c	7.64ab	7.50b
Lemon Juice : Water	01:00	7.42d	7.32c	6.44cd	6.68c
	01:05	7.58cd	7.36c	6.86c	6.88c
	01:10	7.74c	7.38cd	7.42bc	7.40b

Common superscripts indicate that treatments do not differ significantly at 5 and 1 per cent level of probability

declined with increase in concentration from 2 to 3 per cent. Lemon juice as a coagulant reduced the yield of chhana significantly at all concentrations. The results are similar with *De (1952)* who reported that with increase in strength of coagulant there was steady decline in the yield of chhana.

Highly significant differences were observed in fat and total solids recovery of chhana made by using different coagulants. Fat and total solids recovery was significantly higher in chhana made with citric acid and lactic acid. With increase in strength of citric acid from 1 to 3 percent, total solids recovery declined steadily but in the chhana made with 2 per cent lactic acid the highest recovery of total solids was recorded while it declined noticeably at 3 per cent concentration. Highest fat and total solids recovery in the chhana made by using 1 percent citric acid and 2 per cent lactic acid is indicative of minimum fat losses in chhana whey. The findings are in agreement with *Moorthy and Rao (1982)*.

Lemon juice as a coagulant recorded significantly lower yield, fat and total solids recovery of chhana. However, use of lemon juice in low concentration (1:5 and 1:10) enhanced the per cent yield, fat and total solids recovery. The decline in yield, fat and total solids recovery might be due to more loss of solids in whey upon coagulation by lemon juice.

Chemical quality of chhana: Chemical compositions of chhana made by using different coagulants are depicted in Table 3. The moisture content was higher in the product made by using citric acid at all concentrations compared to that of lactic acid. With increase in strength of coagulants, there was reduction in moisture content. Use of lemon juice as coagulant in different concentrations yielded a product with increased moisture content making the product more soft as compared

Table 2: Effect of coagulants on percent yield, fat and total solids recovery of chhana

Coagulant	Concentration	% yield	% fat recovery	% TS recovery
Citric acid	1 %	16.45a	91.46a	60.66a
	2 %	16.26a	90.20a	59.97ab
	3 %	16.12a	89.14a	59.50ab
Lactic acid	1 %	16.33a	90.79a	60.36a
	2 %	16.41a	91.36a	60.69a
	3 %	16.13a	89.76a	59.62ab
Lemon juice: Water	1:0	14.98b	79.61c	55.97b
	1:5	15.29b	82.87c	56.54ab
	1:10	15.45b	83.81b	56.44ab

Common superscripts indicate that treatments do not differ significantly at 5 and 1 per cent level of probability

to citric acid. The reverse trend was observed for total solids, fat and protein content in chhana. The differences in this constituent were recorded marginal in citric acid and lactic acid coagulated chhana. The fat, protein and total solids content were higher in chhana made by using lactic acid at all concentrations as compared to citric acid. Further, it is observed that the fat, protein as well as total solids contents declined tremendously in the product made by using lemon juice indicating much higher losses of solids in whey with use of lemon juice as coagulant at all concentrations.

CONCLUSION

It is concluded that good quality cow milk chhana with optimum yield, total solids recovery and sensory quality could be obtained by coagulating milk with 1 percent citric acid and 2 percent lactic acid.

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Table 3: Effect of different coagulants on chemical composition of chhana

Coagulant	Concentration	Moisture	Total solids	Fat	Protein	Ash
Citric acid	1 %	55.96	44.04	22.20	18.05	1.99
	2 %	55.88	44.12	22.23	18.14	1.98
	3 %	55.84	44.16	22.25	18.06	1.96
Lactic acid	1 %	55.54	44.46	22.24	18.18	2.02
	2 %	55.24	44.76	22.30	18.43	2.03
	3 %	55.20	44.80	22.35	18.40	2.03
Lemon juice: water	1:0	57.10	44.90	21.64	17.28	1.96
	1:5	56.92	43.08	21.76	17.53	1.97
	1:10	56.67	43.33	21.84	17.86	1.99

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