

## SUITABILITY OF BUFFALO MILK FOR PREPARATION OF *CHHANA PODO*

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**Abstract:** Process was standardized to prepare acceptable quality buffalo milk chhana suitable for making chhana podo. Chhana was prepared from standardized buffalo milk (6%fat) and diluted buffalo milk (with 10, 20 & 30% water) by coagulating at different temperatures viz. 70°C (I<sub>2</sub>), 60°C (I<sub>1</sub>) and compared to that of chhana made from cow milk (4% fat) coagulated at 80°C as control (T<sub>0</sub>). Results indicated that the sensory scores with regards to body and texture and overall acceptability of chhana made from buffalo milk and 20% diluted buffalo milk by coagulating at 60°C and 70°C were comparable to that of cow milk chhana. The flavour score was however, significantly superior at 70°C. Further, the body and texture of chhana made from diluted buffalo milk (with 20% water) at 70°C coagulation temperature was superior over that of product made from standardized buffalo milk as well as cow milk but flavour and overall acceptability scores were at par. Chhana made from 20% diluted buffalo milk though exhibited less recovery as compared to that of buffalo milk chhana but the percent recovery of fat and total solids improved significantly which were comparable to that of cow milk chhana. Chhana made from 30% diluted buffalo milk not only exhibited the lowest scores for all the sensory attributes but also adversely affected the yield, fat and total solids recovery.

**Keywords-** Chhana podo, sensory evaluation, standardized milk.

**Introduction:** Among the indigenous dairy products, chhana is a well-known coagulated milk product obtained by acid coagulation of hot milk, which is extensively used as a base material for preparation of variety of Indian delicacies. Cow milk is usually preferred since it yields a product with soft body and smooth texture, the quality of which varies depending upon type and composition of milk, conditions of coagulation, the amount of solids lost in whey and the moisture retained in the product. It is documented that buffalo milk as such is not suitable since it creates lot of difficulties in the manufacture of chhana. The major technological problem in the utilization of buffalo milk is inherent chemical make up as compared to cow milk leading to production of hard body and coarse textured product. Buffalo milk chhana podo had a semi soft body, less brown colouration, coarse texture and less slicing properties with slight cooked flavour (Dash et al.,1999).

Earlier reports indicated that good quality chhana can be prepared from buffalo milk with certain modifications in the processing parameters (Aneja, *et al.*, 1982 and Suguna Rao, *et al.*, 1989). Considering increased production of buffalo milk in India, great scope exists for utilization of this milk with certain modification for preparation of chhana suitable for making chhana podo. In view of this, attempt has been made to optimize the process for getting desirable quality chhana from buffalo milk.

### Materials and Methods:

**a) Milk sample:** The cow milk used for chhana making was collected from the Livestock Unit Of College of Veterinary & Animal Sciences, Parbhani. Buffalo milk was collected from the Dairy Unit of Agriculture College, M.A.U.Parbhani.

**b) Standardization of milk:** The cow and buffalo milk were standardized to 4.0 percent & 6.0 percent fat respectively using fresh skim milk.

**c) Coagulant:** One percent citric acid (w/v) solution was used as a coagulant throughout the investigation.

**d) Method of preparation of chhana:** Chhana was prepared as per the method described by De (1980). Standardized buffalo milk (6 % fat,) and diluted buffalo milk 10 % (J<sub>2</sub>), 20 % (J<sub>3</sub>), and 30 % (J<sub>4</sub>), were heated at boiling temperature and subsequently cooled for coagulation at different temperatures viz., 70° C (I<sub>2</sub>), 60° C (I<sub>1</sub>). One percent citric acid solution heated at 80° C was added to milk slowly with continuous stirring till coagulation takes place and clear whey was observed. The coagulated milk was kept undisturbed for 5 min. The coagulum was transferred to muslin cloth for whey, drainage and collected after 20 min. Chhana made from cow milk (4 % fat) and coagulated at 80° C temperature was used as control (T<sub>0</sub>). Chhana made from buffalo milk standardized with (6% fat) added with 20% water and coagulated at 70°C was used for chhana podo making. Buffalo milk collected from the dairy unit was standardized to 6% fat and used for the preparation of chhana after dilution with 10, 20 and 30% water. Cow milk with 4% fat was used as control (T<sub>0</sub>). Chhana was prepared as per the method described by De (1980) by coagulating milk at different temperatures viz. 80° C (T<sub>0</sub>), 70° C (I<sub>2</sub>), 60° C (I<sub>1</sub>) so as to find out optimum coagulation temperature for getting desirable quality product from buffalo milk.

**e) Sensory profile: Sensory evaluation of chhana was carried out by panel of judges using 9 points hedonic scale (Amerine et al., 1965).**

Percent yield, fat and total solids recovery of the product was calculated and compared to that of product made from cow milk.

**f) Chemical analysis:** Moisture content of chhana was determined as per the method described in BIS (1964). Protein content was determined as per the method described by A.O.A.C. (1975). Fat, Ash and Total solids were estimated according to the method described in BIS (1981).

**Results and Discussion:**

**Sensory quality:** Chhana prepared at different coagulation temperatures from standardized buffalo milk (6% fat) and diluted buffalo milk (10, 20 and 30% water) differed significantly in respect of colour and appearance, body & texture, flavour and overall acceptability. Buffalo milk chhana made at 70°C & 60°C coagulation temperatures had slightly soft body and smooth texture but were comparable to cow milk chhana. The overall acceptability scores of both the products were at par. However, at 60°C coagulation temperature the flavour score reduced significantly. Similar trend was also observed for the product made from 20% diluted buffalo milk. In case of chhana made from 30% diluted buffalo milk, the sensory

scores declined significantly for all the attributes except colour and appearance at all the coagulation temperatures. The results are in agreement with Kundu and De (1972) and Chopde (2002). Thus looking to the quality of chhana prepared at different coagulation temperatures, 70°C coagulation temperature was selected for further study.

The sensory quality of chhana prepared from buffalo milk and diluted buffalo milk differed significantly. Chhana made from diluted buffalo milk exhibited significantly higher scores for body & texture as compared to that of buffalo milk chhana. However, the differences in flavour and overall acceptability scores were at par indicating that 20% diluted buffalo milk was most suitable for getting desirable quality chhana. The sensory scores of chhana made from 30% diluted buffalo milk declined significantly. This indicates that 30% diluted buffalo milk is not suitable for preparation of chhana with desired quality attributes.

**Table 1: Performance index of sensory scores of buffalo milk channa prepared at different coagulation temperatures and / or added water in buffalo milk.**

	Colour	Body and texture	Flavour	Overall acceptability
I <sub>1</sub> J <sub>1</sub>	7.70	7.26	7.55	7.21
I <sub>1</sub> J <sub>2</sub>	7.33	7.27	7.44	7.10
I <sub>1</sub> J <sub>3</sub>	7.49	7.22	7.37	7.38
I <sub>1</sub> J <sub>4</sub>	7.05	6.49	6.93	6.97
I <sub>2</sub> J <sub>1</sub>	7.77	7.33	7.60	7.33
I <sub>2</sub> J <sub>2</sub>	7.22	7.27	7.55	7.27
I <sub>2</sub> J <sub>3</sub>	7.77	7.51	7.49	7.77
I <sub>2</sub> J <sub>4</sub>	6.99	6.89	7.10	6.88

I<sub>1</sub>= 60°C Temperature, I<sub>2</sub>= 70°C Temperature,  
 J<sub>1</sub>= Buffalo milk (6% fat), J<sub>2</sub>= Buffalo milk (10% water dilution),  
 J<sub>3</sub>= Buffalo milk (20% water dilution),  
 J<sub>4</sub>= Buffalo milk (30% water dilution),

**Table.2: Sensory characteristics of chhana from dilute buffalo milk coagulated at 70°C.**

Particulars	Colour & appearance	Body & texture	Flavour	Overall acceptability
Cow milk (Control)	7.84	7.75 <sup>a</sup>	7.62	7.80 <sup>a</sup>
Buffalo milk (6% fat)	7.76	7.29 <sup>b</sup>	7.57	7.27 <sup>b</sup>
10% diluted buffalo milk	7.74	7.27 <sup>b</sup>	7.49	7.19 <sup>b</sup>
20% diluted buffalo milk	7.75	7.46 <sup>ab</sup>	7.45	7.58 <sup>a</sup>
30% diluted buffalo milk	7.70	6.71 <sup>c</sup>	7.38	6.66 <sup>c</sup>

S.E ± 0.08 0.11 0.09 0.09  
 CD NS 0.31 NS 0.24

Common superscripts indicate treatments are not significant at 5% and 1% level of probability.

**Percent yield, total solids and fat recovery:** Percent yield, fat & total solids recovery of chhana made from standardized buffalo milk and diluted buffalo milk differed significantly. The yield of buffalo milk chhana was highest (25.07%) which reduced considerably to 17.12% using 30% diluted milk. The

yield of chhana made from 20% diluted buffalo milk though reduced as compared to that of control, the total solids recovery enhanced significantly as compared to that of control as well as chhana made from standardized buffalo milk indicating that 20% diluted buffalo milk was suitable for preparation of chhana.

**Table. 3: Recovery of chhana from diluted buffalo milk.**

Particulars	Percent yield	Percent total solids recovery	Percent fat recovery
Cow milk (Control)	17.61 <sup>a</sup>	62.11 <sup>a</sup>	74.13 <sup>a</sup>
Buffalo milk (6% fat)	25.07 <sup>b</sup>	64.28 <sup>b</sup>	78.62 <sup>b</sup>
10% diluted buffalo milk	23.19 <sup>b</sup>	65.13 <sup>b</sup>	78.85 <sup>b</sup>
20% diluted buffalo milk	21.27 <sup>b</sup>	66.73 <sup>b</sup>	79.14 <sup>b</sup>
30% diluted buffalo milk	17.12	61.83 <sup>ab</sup>	79.27 <sup>b</sup>

**Chemical quality:** Chemical composition of chhana revealed that with increase in dilution, the moisture and protein content increased slightly while there was slight decline in fat and ash content. The total solids and fat content of chhana made from cow milk and 20% diluted buffalo milk were comparable. Further, dilution of buffalo milk to 30% yielded

comparatively soft product with lowest total solids, fat, and ash content. However, the protein content of the product increased slightly.

**Conclusion:** From the above observations, it is concluded that desired quality chhana suitable for making chhana podo could be prepared from 20% diluted buffalo milk at 70°C coagulation temperature.

**Table. 4: Chemical quality of chhana from diluted buffalo milk.**

Particulars	Constituents (%)				
	Moisture	Total solids	Fat	Protein	Ash
Cow milk (Control)	57.40	42.60	16.60	21.70	2.15
Buffalo milk (6% fat)	55.98	44.02	21.40	18.02	2.25
Buffalo milk diluted with 10% water	56.17	43.83	21.10	18.18	2.23
Buffalo milk diluted with 20% water	56.29	43.71	20.90	18.29	2.22
Buffalo milk diluted with 30% water	56.45	43.55	20.60	18.52	2.20

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