

## Effect of various packaging materials and storage temperatures on chemical quality of cow milk chhana

R.D. DHAGE, R.R. SHELKE, S.D. CHAVAN, K.U. BIDWE AND S.G. GUBBAWAR

### ABSTRACT

In the present investigation, Chhana with a sample of 200 g each was packed in packaging material as P<sub>1</sub>- Butter paper, P<sub>2</sub>- Ploy vinyl chloride (PVC) film, P<sub>3</sub>- PVC container, P<sub>4</sub>- Tin can and stored under 3 different temperatures as T<sub>1</sub>- 0°C with 95 per cent R.H, T<sub>2</sub>- 4°C with 85 per cent R.H., T<sub>3</sub>- 10°C with 70 per cent R.H. under study for the preservation of chhana. It was found that, the packaging material has significant effect on increase in acidity. There was significant increase in acidity in samples P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub> and P<sub>4</sub> with rise in temperature. Significant effect of temperature and packaging material was observed on the protein content of chhana. The lactose content was found in decreasing trend with increase in storage temperature. In all packaging materials, (P<sub>2</sub>) PVC film package was having significantly superior acceptability score.

**KEY WORDS** : Chhana, Preservation, Packaging, Relative humidity, Temperature

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### INTRODUCTION

Milk is nature's gift. It has excellent nutritional qualities which supplies body building proteins, bone forming minerals, vitamins and energy in the form of lactose and milk fat. As protective food of high palatability and digestibility for human, milk and milk products are the sources of animal protein to the lacto-vegetarians. Chhana is an acid coagulated indigenous milk product obtained after separating whey from coagulum.

The coagulants mostly used are sour chhana, lactic acid, citric acid and juice of citrus fruits. According to Prevention of Food Adulteration Act (1976), the product shall not contain more than 70 per cent moisture and less than 50 per cent fat on dry matter basis. Cow milk is most suited for making chhana. Proper packaging material and storage temperature would be definitely helpful in maintaining the hygienic condition and quality of chhana for longer duration. The present investigation was carried out with objectives to know the proper packaging material for

chhana and to compare the shelf-life of chhana stored at different temperatures.

### MATERIALS AND METHODS

The study was undertaken in the Department of Animal Husbandry and Dairying, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The cow milk obtained from livestock Instructional Farm of the department was standardized at 3.5 per cent fat. After analyzing the milk for knowing per cent contents of protein, fat, solid not fat, total solid, chhana was prepared by following the method described by De (1980). The standardized milk was heated at 100°C for 5 minutes then cooled to 80-85 °C and coagulated by addition of 1.5 per cent citric acid. After separation of solid material, chhana was drained out.

Chhana with a sample of 200 g each was packed in packaging material under study for the preservation of chhana.

- P<sub>1</sub>- Butter paper
- P<sub>2</sub>- Ploy vinyl chloride (PVC) film
- P<sub>3</sub>- PVC container
- P<sub>4</sub>- Tin can

**Packed samples of chhana were stored under 3 different temperatures:**

- T<sub>1</sub>- 0°C with 95 per cent R.H

#### Correspondence to:

R.R. SHELKE, Department of Animal Husbandry and Dairying, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA

#### Authors' affiliations:

R.D. DHAGE, S.D. CHAVAN, K.U. BIDWE AND S.G. GUBBAWAR, Department of Animal Husbandry and Dairying, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA

T<sub>2</sub>- 4°C with 85 per cent R.H.

T<sub>3</sub>- 10°C with 70 per cent R.H.

Chemical analysis of the chhana samples was carried out after 15 days for determination of protein acidity, lactose and free fatty acid content. All the observation data so collected were statistically analyzed.

## RESULTS AND DISCUSSION

The effect of different temperatures and packaging materials on moisture content, acidity, protein and lactose content of chhana was studied and presented in Table 1.

From the Table 1, it was observed that with the increase in storage temperatures, there was significant decrease in moisture content, it might be due to more loss of moisture due to evaporation during storage at higher temperature. The moisture percentage in butter paper (P<sub>1</sub>) packaging was significantly lowered as compared to other packaging materials *i.e* 52.75 per cent. Comparatively PVC film was found suitable for packaging chhana. In case of acidity, chhana showed significant increase with the increase in temperatures. Maximum acidity (36 per cent) was observed in the chhana stored at 10 °C temperature. However, it was noticed that there was significant increase in the average acidity of chhana samples in all the packages.

**Table 1 : Effect of different temperatures and packaging materials on moisture, acidity, protein and lactose content of chhana**

Name of factor	Moisture %	Acidity %	Protein %	Lactose %
<b>A. temperature</b>				
T <sub>1</sub> - 0°C	52.96	0.30	16.91	2.09
T <sub>2</sub> - 4°C	52.93.	0.31	16.84	2.07
T <sub>3</sub> - 10°C	52.82	0.36	16.66	1.95
SE (m)±	0.0014	0.0003	0.00067	0.00028
CD at 5 %	0.005	0.0068	0.018	0.007
<b>B. Packaging material</b>				
P <sub>1</sub> - Butter paper	52.75	0.33	16.66	2.03
P <sub>2</sub> - PVC film	52.99	0.32	16.90	2.04
P <sub>3</sub> - PVC	52.91	0.32	16.80	2.03
container	52.98	0.32	16.86	2.05
P <sub>4</sub> - Tin can				
SE (m)±	0.0016	0.0004	0.0077	0.00033
CD at 5 %	0.006	0.0079	0.019	0.009

It was also seen that chhana stored under 0°C, 4°C and 10°C temperatures showed significant decrease in

protein content with the rise in temperatures. The initial mean value of protein content (17.52 per cent) was reduced to 16.91 per cent (0°C), 16.84 per cent (4°C), and 16.66 per cent (10°C). The protein content was observed to be decreased in different packaging materials. The decrease in protein content was higher (16.66 per cent) in P<sub>1</sub>- Butter paper than the other packaging materials. It was also observed that there was significant effect of temperature on lactose content in chhana at 0°C, lactose content was (2.09 per cent) which was reduced( 1.95 per cent) upto 10°C. Maximum decrease was in (2.05 per cent) chhana packed in Tin cans (P<sub>4</sub>) as compared to other packaging materials.

### Effect of temperature and packaging on overall acceptability of chhana:

It was observed from Table 2, that sample packed in PVC film (P<sub>2</sub>) stored at 0°C (84.15), 4°C (83.73) and 10°C (72.32) secured significantly more score. This was followed by P<sub>3</sub>, P<sub>4</sub> and P<sub>1</sub> packages. Therefore, it appears that the PVC- film (P<sub>2</sub>) packages was comparatively suitable than remaining three packaging materials. The interaction revealed that butter paper (P<sub>1</sub>) was found unsuitable for packaging chhana at all temperatures, which might be due to post manufacturing contamination of chhana during storage. Kumar and Shrinivasan (1982) recommended the use of tin containers for storage of chhana at 37°C.

**Table 2 : Combined effect of temperature and packaging on overall acceptability of chhana.**

Packaging material	Temperature			Mean
	T <sub>1</sub> (0°C)	T <sub>2</sub> (4°C)	T <sub>3</sub> (10°C)	
P <sub>1</sub>	79.81	82.40	64.30	75.50
P <sub>2</sub>	84.15	83.73	72.32	80.07
P <sub>3</sub>	83.25	82.12	68.03	77.80
P <sub>4</sub>	82.91	83.00	67.63	77.85
Mean	82.53	82.81	68.07	

SE (m)± 0.4869      CD at 5 % 1.20

### Effect of different temperatures, packaging materials and storage periods on overall acceptability of chhana:

It was observed from Table 3, that shelf life of chhana was significantly less at 10°C as compared to 0°C and 4°C. This was probably due to the fact that higher temperature was more favourable for growth and multiplication of microorganisms which might have resulted in securing lower score at 10°C than 0°C and 4°C. The sensory score was significantly more for PVC film P<sub>2</sub> followed by P<sub>4</sub>, P<sub>3</sub> and P<sub>1</sub> packaging material.

**Table 3: Effect of different temperatures, packaging materials and storage periods on overall acceptability of chhana**

Factors	Sensory score (out of 100)
A. Temperature	
T <sub>1</sub> - 0°C	82.53
T <sub>2</sub> - 4°C	82.81
T <sub>3</sub> - 10°C	68.07
SE (m)±	0.2184
CD at 5 %	0.60
B. Packaging material	
P <sub>1</sub> - Butter paper	75.50
P <sub>2</sub> - PVC film	80.70
P <sub>3</sub> - PVC container	77.80
P <sub>4</sub> - Tin can	77.85
SE (m)±	0.2522
CD at 5 %	0.69

**Conclusion:**

The increase in storage temperature significantly decreased moisture content in chhana. The packaging material has significant effect on increase in acidity. It was found that there was significant increase in acidity in samples P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub> and P<sub>4</sub> with rise in temperature. There was significant effect of temperature and packaging material on the protein content of chhana. The lactose content was found in decreasing trend with increase in storage temperature. In all packaging materials (P<sub>2</sub>) PVC film package was having significantly superior acceptability score.

Among all the packages, it was found that PVC film (P<sub>2</sub>) packaging has proved its superiority over the other packages when the chhana was stored at different (0°C, 4°C and 10°C) temperatures.

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