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# Effect of Different Coagulants on Sensory Quality of Paneer

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**ABSTRACT**

*Paneer is Heat-acid Coagulated and an important indigenous milk product, which is extensively used as base material or filler in preparation of large number of culinary dishes. Paneer is good source of animal protein to the vegetarian food. Effect of different coagulants i.e Citric acid (2%), Lactic acid (2%), Tartaric acid (2%) and Lemon juice (Fresh as such) on Sensory Characteristics of paneer prepared using buffalo and cow milk. Buffalo milk could be successfully utilized for preparation of paneer by using lactic acid as Coagulant*

***Key word:*** *Cow milk, Buffalo milk, Paneer, Coagulant, Statistical analysis*

## INTRODUCTION

India is the largest milk producing country in the world with 155.5 million tones milk production and per capital availability 337gms/day (2015-16). Pattern of milk utilization in India indicates that about 37.7% of total milk produced in India is converted in various milk products which occupies prominent place in Indian economy[9]. *Chhana*, a heat acid coagulated product of the milk forms the base material for manufacturing *Paneer*. Pattern of milk production in India indicates that about 6 per cent of the milk produced is coagulated to produce *chhana*[9]. *Paneer* is an important indigenous milk product, which is extensively used as base material or filler in preparation of large number of culinary dishes. *Paneer* production in India is about 2, 35,000 tonnes which amounts to Rs. 18 billion[5]. This indicates that there is tremendous scope for manufacture and marketing of *paneer*. According to PFA act (1976) *paneer* means the product obtained from cow or buffalo milk or combination thereof by precipitation with sour milk, lactic acid or citric acid. It shall not contain more than 70 per cent moisture and the milk fat content shall not be less than 50 per cent of the dry matter. *Paneer* is an Indian variety of soft cheese characterized by typical mild acidic flavor with slightly sweet taste, spongy body and close-knit texture. It is a rich source of protein and fat. It contains 53-55% moisture, 23-26% fat, 17-18% protein, 2-2.5% carbohydrates and 1.5 to 2.0% minerals[4]. The quality of *paneer* prepared depends upon the type and quality of milk used, heat treatment of milk, type, strength and amount of coagulant used, coagulation temperature and pH of coagulation[8].

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The present study entitled "Effect of different coagulants on Sensory Quality of paneer was undertaken with following objectives :

1. To standardize the procedure for manufacturing paneer by using different coagulants.
2. To find out suitable coagulant for preparation of *paneer*.
3. To study the Sensory Quality of *paneer* by using different coagulants.

## MATERIAL AND METHODS

**MATERIAL:**

**Raw milk**: Bulk raw milk from the herd of crossbred cows and buffalo maintained at dairy unit of College of Agriculture, Dapoli was used for the study.

**Coagulants:** For *paneer* preparation following coagulants was used:

1) Citric acid 2)Lactic acid 3)Tartaric acid 4)Lemon juice

**Equipments and Accessories:** Aluminum and stainless-steels vessels.**,**Karahi.

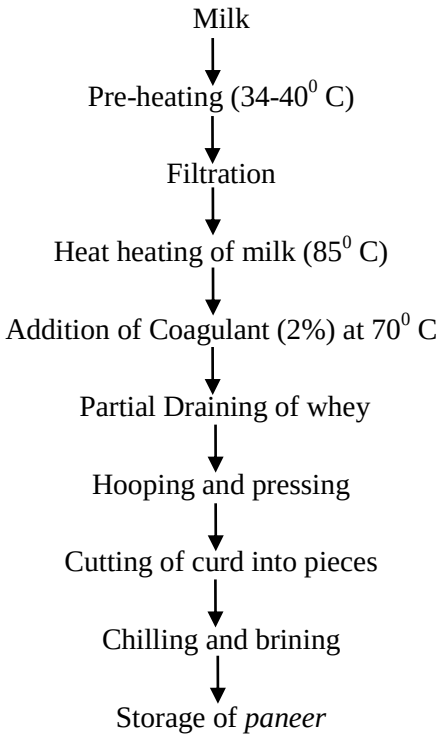
Ladle, Muslin cloth, *Paneer* hoop, Standard weights.

**Methodology**

**Preparation of *Paneer*.**

*Paneer* was prepared as per the procedure standardized by battacharya *et al.*[1]. The flow diagram of *paneer* manufacturing is given hereunder:

**Flow diagram**




**Treatments:**

**Type of milk:**

**$T_1$**- Cow milk**,**

$T_2$- Buffalo milk

**Type of coagulants**:

$C_1$-Citric acid (2%)

$C_2$-Lactic acid (2%)

$C_3$-Tartaric acid (2%)

$C_4$-Lemon juice (Fresh as such)

**Treatment combinations:**

**$T_1C_1$**- Cow milk/Citric acid

**$T_1C_2$**- Cow milk/Lactic acid

**$T_1C_3$**- Cow milk/Tartaric acid

**$T_1C_4$**- Cow milk/Lemon juice

**$T_2C_1$**- Buffalo milk/Citric acid

**$T_2C_2$**- Buffalo milk/Lactic acid

**$T_2C_3$**- Buffalo milk/Tartaric acid;

**$T_2C_4$**- Buffalo milk/Lemon juice

**Replications:** The trial was conducted with six replications.

**Sensory Evaluation of *Paneer*.**

The *paneer* was evaluated organoleptically for various quality attributes such as flavour, body and texture, Colour and appearance and Overall acceptability by a panel consisting of ten judges. A score card was prepared on the basis of 9 point hedonic scale as per IS: 6273 (Part-II) [2].

**Statistical Design and Analysis:** The sensory score of *paneer* was compared statistically to test the significance of difference by Friedman's test of concordance as described in IS: 6273 (Part-III) [3]. The mathematical model used is as under:

$$T = \frac{12 \sum_{i=1}^{n} Ri2}{mn(n+1)} - 3m(n+1)$$

m= number of panelists
n= number of samples
Ri= sum of ranks for $i^{th}$ sample

## RESULT AND DISCUSSION

The Sensory Quality of *paneer* was judged for different attributes Viz. General appearance, flavour, Body & Texture and Overall Acceptability by panel of ten judges by using nine point hedonic scale card. Each sample was bearing a code number as to avoid its identity and have impartial results. The results and Statistical Analysis are furnished in Table no.

**Table 1: Effect of different Coagulant on Sensory Quality of *Paneer***

| Treatments | Sensory Parameters( Using 9 point hedonic scale ) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | General appearance | | flavour, | | Body and Texture | | Overall Acceptability | |
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| T1C1 | **6.90** | 7 | **6.76** | 7 | 6.85 | 6 | 6.83 | 7 |
| T1C2 | **7.17** | 5 | **7.17** | 4 | 7.35 | 3 | 7.23 | 4 |
| T1C3 | **7.04** | 6 | **7.02** | 6 | 6.96 | 5 | 7.00 | 6 |
| T1C4 | **6.90** | 7 | **6.72** | 8 | 6.74 | 7 | 6.78 | 8 |
| T2C1 | **7.63** | 2 | **7.50** | 2 | 7.46 | 2 | 7.53 | 2 |
| T2C2 | **7.66** | 1 | **7.55** | 1 | 7.50 | 1 | 7.58 | 1 |
| T2C3 | **7.56** | 3 | **7.43** | 3 | 7.35 | 3 | 7.49 | 3 |
| T2C4 | **7.23** | 4 | **7.11** | 5 | 7.18 | 4 | 7.17 | 5 |
| **T Cal =** | **13.32** | | **12.72** | | **15.00** | | **18.6** | |
| **TableValu =** (P< 0.05). | **14.07** | | **4.07** | | **14.07** | | **14.07** | |

**General appearance:**

Sensory score for general appearance of *paneer* prepared under different treatments is presented in Table 1. Good quality *paneer* had uniform white and yellowish colour when made from buffalo and cow milk, respectively[7] .Pal and Gupta[6] studied the sensory evaluation of Indian milk products. In their study they mentioned desirable characteristic of *paneer*. They stated that colour of good quality product should be even and white or dull white. Further, they reported that if *paneer* is not properly covered, the evaporation of moisture from surface during storage takes place resulting into development of yellowish colour at the surface and whitish in the centre and this is not desirable.

The perusal is of Table 1 shows that the *paneer* prepared by using buffalo milk using 2 per cent lactic acid was superior amongst all the treatments in general appearance which recorded the maximum score (7.66) followed by *paneer* from same buffalo milk using 2 per cent citric acid (7.63). The lowest score was obtained by the product from cow milk coagulated with citric acid and lemon juice (6.90 each).

In case of *paneer* prepared from cow milk, it was observed that *paneer* prepared by using lactic acid scored highest i.e. 7.17 followed by using tartaric acid as coagulant (7.04).

It was noticed that among all coagulants and types of milk, judges scored more for all coagulants when buffalo milk was used for preparation of *paneer* rather than cow milk.

*Paneer* prepared from buffalo and cow milk by using citric acid and lactic acid as coagulants showed clean appearance with uniform white and uniform yellowish colour to the product prepared from buffalo milk and cow milk, respectively. Whereas *paneer* from both the types of milk using lemon juice as coagulant scored lowest as it showed dull, dry appearance.

**Body and texture:**

The data pertaining to sensory score for body and texture of *paneer* prepared under different treatments are given in Table 1.

*Paneer* should have firm and cohesive body. The texture of *paneer* should be compact and close knit, it shall not, however, be sticky, grainy or coarse[6].

From the average figure for body and texture it was observed that *paneer* from buffalo milk by using lactic acid as coagulant scored highest (7.50) followed by citric acid (7.46). Cow milk *paneer* with lactic acid as coagulant i.e. treatment T1C2 scored highest (7.35). *Paneer* prepared form buffalo milk and cow milk by using lemon juice as coagulant scored lowest i.e. 7.18 and 6.74, respectively.

The results from Table-1 showed that *paneer* from cow milk possessed overall lower score as compared to the score of *paneer* from buffalo milk. Lower score of cow milk *paneer* may be due to loose body and pasty texture. Buffalo milk *paneer* possessed soft-body and smooth texture which was mostly liked by the judges

**Flavour:**

The sensory score for flavor of *paneer* prepared under different treatments is presented in Table 1.

*Paneer* is an important indigenous dairy product. Good quality *paneer* is characterized by its acidic flavour with slightly sweet taste[10].

From the table 1, it was observed that the highest score was obtained by *paneer* prepared from buffalo milk using lacitc acid (7.55 per cent) followed by *paneer* prepared from buffalo milk using citric acid (7.50 per cent). Lowest score was possessed for *paneer* prepared for both the types of milk i.e. buffalo and cow by using lemon juice as coagulant, 7.11 and 6.72, respectively. The reason for low score may be due to acidic smell and sour test i.e. flat flavour which was not liked by judges. Buffalo milk *paneer* prepared by using citric acid or lactic acid as coagulant produced pleasing with acidic smell and sweet taste.

**Overall acceptability:**

The overall acceptability of *paneer* prepared from milk of cow and buffalo by using different coagulants is tabulated in Table 1. For overall acceptability average score obtained for general appearance, flavor and body and texture was considered. From the average figures of overall acceptability in Table 1 , it is seen that *paneer* prepared from buffalo milk using lactic acid (2 per cent) scored highest points (7.58) followed by treatment T2C1 i.e. *paneer* from buffalo milk coagulated by citric acid (7.53). Lowest score was recorded by *paneer* prepared by using cow milk coagulated with lemon juice (6.78).

On the basis of results we can affirmatively state that among the type of coagulants lactic acid can be used for the preparation of best quality *paneer*

**Cost of production:**

The cost *paneer* productions by using different Coagulants are given in table 2.

The production cost of paneer is based on prevailing market rates of ingredients used only.

**Table 2: Cost of production of *paneer***

| Treatments | T1C1 | T1C2 | T1C3 | T1C4 | T2C1 | T2C2 | T2C3 | T2C4 |
|---|---|---|---|---|---|---|---|---|
| Cost/kg (Rs.) | 148/- | 143/- | 161.11/- | 171.21 | 151/- | 141/- | 161.35/- | 161/- |

The production cost of *paneer* at most acceptable Treatment i.e by using buffalo milk and lactic acid (T2C2) was Rs.**141/-** per Kg.

## CONCLUSION

From the results of present investigation it may be concluded that lactic acid could be successfully utilized for preparation of *paneer*. The most acceptable quality *paneer* can be prepared from buffalo milk by using lactic acid as coagulant (T2C2). Addition of lactic acid in *paneer* improved sensory quality and acceptability of the product. Cow milk alone produced inferior quality *paneer* as compared to buffalo milk. The production cost of *paneer* at most acceptable treatment i.e by using buffalo milk and lactic acid (T2C2) was Rs.**141/-** per Kg.

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