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Research Article

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Effect of Different Coagulant on Yield of Paneer

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ABSTRACT

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). There is scope for expanding and improving the indigenous confections by introducing a variety of products adopting improved methods and technology. 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 coagulant i.e Citric acid (2%), Lactic acid (2%), Tartaric acid (2%) and Lemon juice (Fresh as such) on yield and Total solid recovery of paneer prepared using Buffalo and Cow milk. lactic acid and Buffalo milk could be successfully utilized for preparation of paneer and give higher yield (Average 20.86%) and total solid recovery (Average 66.39 %) as compared to using other 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[12] *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*[12] & *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. This indicates that there is tremendous opportunity 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.

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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 flavour 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 .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[11].

Paneer is mainly used as base material in the preparation of various culinary dishes like curries of peas, potatoes, spinach etc. *Paneer* snacks are close competitors of those made out of fried fish or chicken in terms of popularity. *Paneer* is good source of animal protein to the vegetarian food. It is an excellent match of non-vegetarian food.

The present study entitled "Effect of different coagulants on yield 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 find out yield and total solid recovery of *paneer*

MATERIAL AND METHODS

Material:

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

Coagulants: For the coagulation of milk during *paneer* preparations following coagulants were used:

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

Equipments and Accessories: Aluminium and stainless-steels vessels., Karahi.

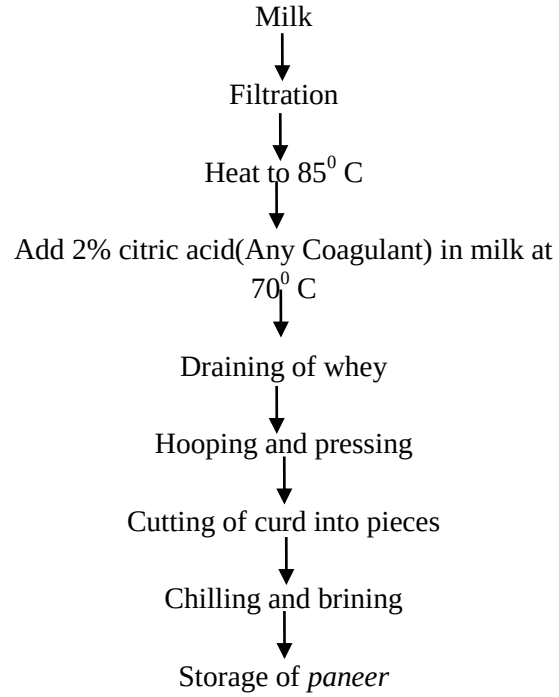
Ladle, Muslin cloth, *Paneer* hoop, Standard weight.

Methodology

Preparation of *Paneer*.

Paneer was prepared as per the procedure standardized by battacharya *et al*[2]. 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.

Yield of *Paneer*: Yield of *paneer* at each treatment was recorded and percent recovery was calculated.

Statistical Design and Analysis: The statistical design adopted to study the different aspects was Factorial Randomized Block Design with six replications and eight treatment combinations. The statistical

analysis was carried out according to Snedecor and Cochran[16].

RESULTS AND DISCUSITION

The results of present research work are average of six time replicated data tabulated, presented and discussed along with Statistical analysis under following main heads.

Total solids recovery:

Data patinent to total solids recovery in *paneer* prepared from types of milk by using different coagulants are presented in Table1 and illustrated in Fig. 1

Table 1: Total solids recovery of *paneer* (per cent)

Type of milk	Citric acid (C1)	Lactic acid (C2)	Tartaric acid (C3)	Lemon juice (C4)	Mean
Cow milk (T1)	60.64	63.69	56.10	59.07	59.87
Buffalo milk (T2)	61.44	**66.39**	57.86	60.36	61.51
Mean	61.04	65.04	56.98	59.71	60.69

Source	S.E (±)	C.D (P=0.05)	Result
Milk	0.6452	1.8525	**
Coagulant	0.9125	2.6198	**
Interaction	0.2150	0.6175	**

** Significant at 5%

The per cent recovery of milk solids in buffalo milk *paneer* was higher than that of cow milk i.e. 61.51 and 59.87 per cent, respectively (Table 1).

De and Ray[5] reported that per cent recovery of milk solids as 65 and 68 per cent in *chhana* from cow and buffalo milk, respectively. Joshi also observed same trend in respect of recovery of milk solids. He reported 61.53 and 71.66 per cent recovery in *chhana* from cow and buffalo milk, respectively. Higher recovery of milk solids in buffalo milk *chhana* may be due to higher fat level in buffalo milk as suggested by De and Ray[5] and Kundu and De[7].

Total solids recovery values showed similar trends as exhibited by total solids content. The results thus indicate that coagulants did not have any noticeable effect on recovery of milk solids in *paneer*. The findings are in agreements with those of Bhattacharya *et al.*[2] who reported that buffalo milk *paneer* contained significantly higher total solids and showed higher recovery of total solids in *paneer* as compared to cow milk *paneer*.

The various types of coagulant significantly influenced the total solids recovery of *paneer*. The treatments C2, C1 and C4 produced significantly higher total solids recovery in *paneer* than treatment C3 i.e. 65.04, 61.04, 59.71 and 56.98 per cent, respectively.

Sachdeva and singh[14] reported that lactic acid resulted in higher total solids recovery in *paneer* (65.67 per cent) than citric acid (62.31 per cent) and tartaric acid (62.22 per cent).

Yield of *paneer*:

The yield of *paneer* mainly depends upon the type of milk used, heat treatment, coagulant and its concentration and other aspects which are known to vary to a great extent[2,6] . According to Rao *et al*[11]. higher yield (20.35%) of *paneer* can be obtained from milk heated to 85^0 c and coagulated at 70^0 c.

The results given in Table 2 and Fig. 2 shows the yield of *paneer* prepared from cow and buffalo milk with different types of coagulant.

Table 2: Yield of *paneer* (per cent)

Type of milk	Types of coagulant				Mean
	Citric acid (C1)	Lactic acid (C2)	Tartaric acid (C3)	Lemon	
Cow milk (T1)	17.21	17.93	16.68	16.92	17.18
Buffalo milk (T2)	19.44	**20.86**	19.02	19.15	19.61
Mean	18.32	19.39	17.85	18.03	18.39

Source	S.E (±)	C.D (P=0.05)	Result
Milk	0.01531	0.04400	**
Coagulation	0.02167	0.06222	**
Interaction	0.00510	0.01466	**

** Significant at 5%

The yield of *paneer* from buffalo milk (19.61 per cent) was significantly higher than the yield produced from cow milk (17.18 per cent), respectively.

The results of present investigation are in close aggrement with the values reported by Pal *et al.*[9], Singh and Kanawjia[15] who reported 21.00 ± 1.59 per cent and 22.0 per cent yield of *paneer* prepared from buffalo milk, respectively. Singh and Kanawjia[14] reported 17.4 per cent yield of *paneer* prepared from cow milk. Syed reported that average yields of *paneer* were 14.14, 18.24 and 9.85 per cent when made from cow milk (4.5% fat and 8.5% SNF), buffalo milk (6% fat and 9.5% SNF) and cow skim milk (0.10% fat), respectively.

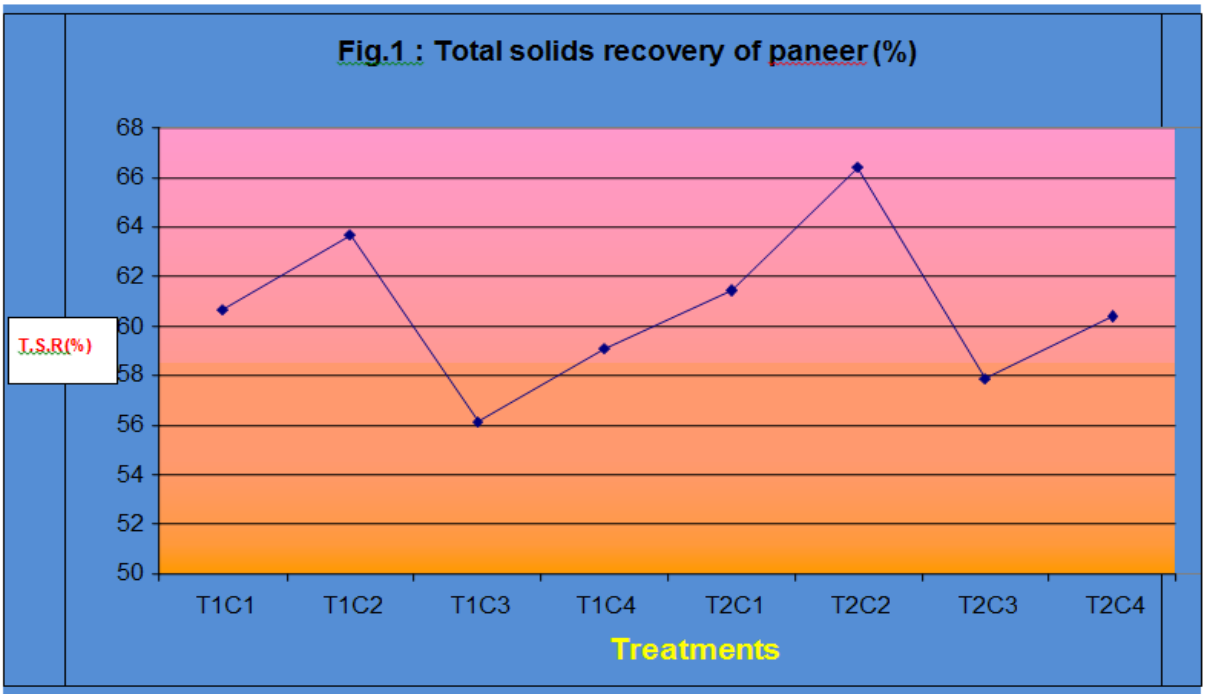
In general, the yield decreases with increase in the strength of coagulant, coagulation temperature and lowering the pH of coagulation in case of buffalo milk[14] and it increases with increase in the coagulation temperature in cow milk *paneer*[14].

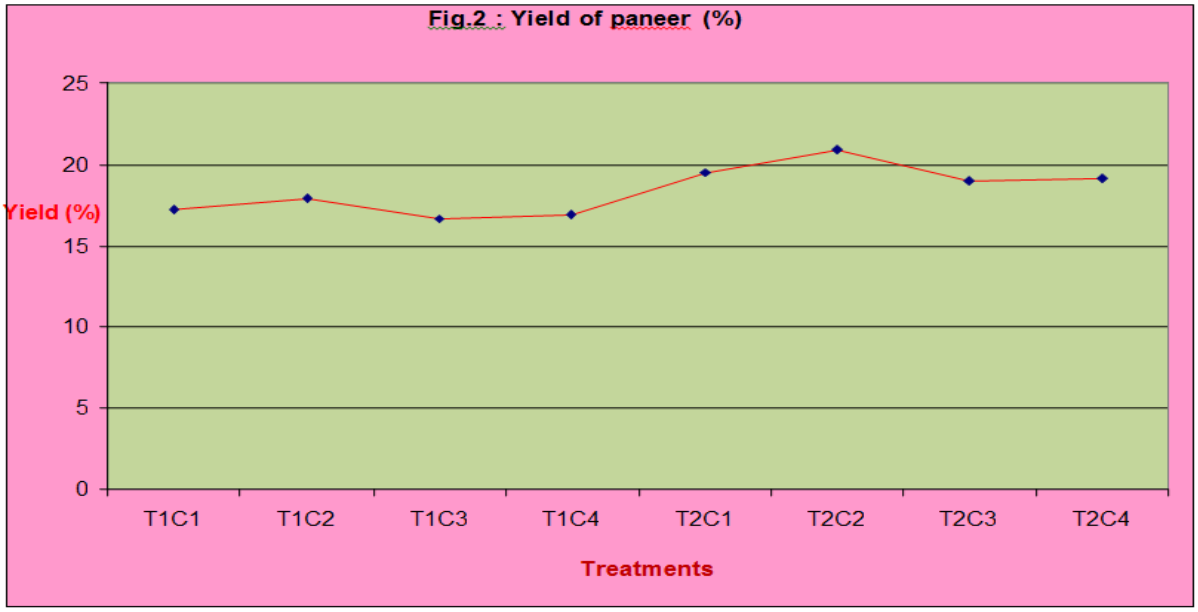
The yield of *paneer* depends mainly on the total solids content of milk and amount of moisture retained in *paneer*[4]. According to Chandan the yield of *paneer* is dependent on the fat and solids not fat content of the starting milk, as well on the moisture, fat and protein retained in the *paneer*.

In the present investigation higher yield of *paneer* obtained from buffalo milk may be attributed to the high total solids content in the milk. The perusal of Table 1 revels that the milk solids recovery was also higher in buffalo milk *paneer* (61.51 per cent) as compared to cow milk *paneer* (59.87 per cent).

Yield of *paneer* varied significantly due to coagulants. Significant variation in the yield of *paneer* prepared with citric acid , lactic acid, tartaric acid and lemon juice may be the result of significant variation in total solids recovery in the product (Table 1). The yield of *paneer* at treatment C1, C2, C3 and C4 were 18.32, 19.39, 17.85 and 18.03 per cent, respectively. Sachdeva and Singh[14] observed 21.80, 21.67 and 22.58 per cent yield of *paneer* for coagulants viz citric acid, tartaric acid and lactic acid, respectively.

The interaction between types of milk and coagulants showed significant differences for their influnces on yield of *paneer*. This indicates that the variation in yield of *paneer* due to types of milk was different at different types of coagulant.





CONCLUSION

From the result of present investigation it may be concluded that lactic acid and Buffalo milk could be successfully utilized for preparation of *paneer* and give higher yield and total solid recovery as compared to using other Coagulant.

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