



Studies on chemical quality of *Sandesh*

V. N. PATIL, R. M. KADAM, P. S. NAIK AND S.V. JOSHI

ABSTRACT : India is the largest milk producing country in the world with 114.4 million tones milk production and per capital availability 268g/day. Dairy in India has meant to our people since ancient days, milk production primary through the cow keeping and using the cow milk mainly for use of family and for religious rituals. *Sandesh* is the one of the most popular traditional milk products in Indian subcontinent. Pattern of milk production in India indicates that about 6 per cent of the milk produced is coagulated to produce *Chhana*. Out of this, about 80 per cent is used for manufacture of *Sandesh*. The efforts are made in the present investigation to add the value of *Sandesh* by incorporating the mango pulp @ 7.5 per cent, 15 per cent, 22.5 per cent and 30 per cent of weight of *Chhana*. The different physico-chemical properties were determined. It is concluded, the cow milk *Chhana* used for *Sandesh* preparation contained on an average 23.38 per cent fat, 45.37 per cent total solids, 17.33 per cent protein and 0.31 per cent acidity. Total solids content of *Sandesh* decreased significantly with increase in the level of mango pulp. The average values for control, 7.5, 15, 22.5 and 30 per cent levels of mango pulp were 75.27, 74.30, 73.31, 72.35 and 71.01 per cent total solids, respectively. With the increase in the level of mango pulp, there was significant decrease in fat content of *Sandesh*. protein content of *Sandesh* varied significantly with the values of 18.35, 17.89, 17.54, 17.21 and 16.89 per cent at control, 7.5, 15, 22.5 and 30 per cent level of mango pulp, respectively. With the increase in the level of mango pulp, there was significant decrease in protein content of *Sandesh*. Whereas With the increase in the level of mango pulp, there was significant increase in acidity of *Sandesh*.

KEY WORDS : Cow milk, Chhana, Citric acid, Mango pulp

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INTRODUCTION

India is the largest milk producing country in the world with 114.4 million tones milk production and per capital availability 268g/day (Kalalselvi and Somasundaram, 2011). Dairy in India has meant to our people since ancient days, milk production primary through the cow keeping and using the cow milk mainly for use of family and for

religious rituals. Pattern of milk utilization in India indicates that about 37.7 per cent of total milk produced in India is converted in various milk products which occupies prominent place in Indian economy (Sahu, 2007). The values of milk output and milk product India exceed Rs. 10×10^6 million in 2001. Out of this the traditional milk product is estimated at over Rs. 5.7×10^6 million (Aneja *et al.*, 2002). *Sandesh* is the one of the most popular traditional milk products in Indian subcontinent. *Chhana*, a heat acid coagulated product of the milk forms the base material for manufacturing *Sandesh*. Pattern of milk production in India indicates that about 6 per cent of the milk produced is coagulated to produce *Chhana*. Out of this, about 80 per cent is used for manufacture

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of *Sandesh* (Sahu and Das, 2007).

Sandesh of many varieties is manufactured and sold in the country. These varieties of *Sandesh* differ in their appearance, flavour, colour, body, texture, rheology and composition. Generally three main types of *Sandesh*; namely *Narampak* (soft grade), *Karapak* (Hard grade) and *Kachhagolla* are manufactured in different parts of the country. *Sandesh* has yellowish white to pale yellow colour, a sweet, pleasant, slightly cooked, caramelized flavor with soft and cohesive body, smooth texture with small size grains (Sen and Rajorhia, 1987 and Aneja, 1997). However, available literature indicates that no work has been so far carried out on utilization of mango (*Mangifera indica* L.), a fruit of Konkan region, for incorporation in the manufacture of *Sandesh*. It is, therefore, thought to explore the possibility of utilizing mango pulp in preparation of *Sandesh*.

Objectives research work :

- To study chemical analysis of *Sandesh* with different level of mango pulp
- To standardize the manufacturing technology of *Sandesh* incorporated with mango pulp
- To Effect of mango pulp on chemical quality of *Sandesh*

Rajorhia and Sen (1988) described traditional method of production of *Chhana* which is prepared by boiling about 20-40 lit of the cow milk or mixed milk in an karahi to about 80-85°C and coagulated in small installment. While gently stirring the content with help of ladle, the process is continued until all milk goes precipitated in the lump, which settles down at bottom. The top is filtered through a muslin cloth.

Aneja (1997) reported that Nalin type of *Sandesh* is prepared from date gur (Jagary). It is considered a delicacy and commands higher price. He further reported that there are two types of *Sandesh* available made from skim milk *Chhana*, one a drier variety made of old *Chhana* and other softer variety made of fresh *Chhana*

Shelke *et al.* (2002) explained the method of preparation of *Chhana* as: *Chhana* was prepared from cow milk which was pre-standardized to 4 per cent fat as suggested by Singh and Ray (1977). Filtered milk was then taken transferred to stainless steel vessel and heated to 90°C. Steaming was discontinued and temperature of milk was lower to 80°C followed by gradual addition of

citric acid solution 1.5 per cent (w/v) until the milk was coagulated and the acidity of whey reached upto 0.16, 0.18 and 0.20 per cent, respectively in three treatments, pH was not measured during coagulation. Coagulum was separated by straining to obtain *Chhana*.

Badyopadhyay (2006) stated that for production of *Sandesh*, *Chhana* is ground into smooth paste. Sugar mixed with kneaded *Chhana* and the mixture is then slowly cooked with continuous stirring and scrapping in shallow pan. When the desired aroma and texture is reached the mix is cooled and moulded in fancy shapes like shell, flower, fish etc.

Chemical quality :

Mugdha (1989) studied the effect of milk coagulant *viz.*, citric acid, aged whey and lemon juice on quality of *Sandesh* and reported the chemical composition of *Sandesh* as in range of 21.21 to 23.21 per cent moisture, 22.17 to 24.06 per cent fat, 19.86 to 21.81 per cent protein, 1.217 to 1.365 per cent ash, 30.73 to 33.52 per cent sucrose and 0.279 to 0.324 per cent acidity.

Sen and Rajorhia (1991) reported the chemical composition of narampak type of buffalo milk *Sandesh* as: moisture 23.97 to 25.00 per cent, fat 20.51 to 21.78 per cent, protein 16.79 to 18.21 per cent, total sugar 33.99 to 35.18 per cent and ash 1.94 to 2.11 per cent.

Dure-Patil (1994) mentioned the chemical composition of cow milk *Sandesh* prepared by using citric acid as coagulant and different levels of sugar as: *Sandesh* prepared with 25 per cent sugar contained 73.56 per cent total solids, 20.23 per cent fat, 0.24 per cent acidity and 20.29 per cent protein. *Sandesh* prepared with 35 per cent sugar contained 74.07 per cent total solids, 15.40 per cent fat, 0.24 per cent acidity and 16.32 per cent protein.

Mane (2006) reported that cow milk *Chhana* contains 22.41 per cent fat, 45.03 per cent total solids, 16.40 per cent protein and 0.33 per cent acidity.

Singh *et al.* (2006) studied that the chemical composition of market sample of *Sandesh* from different sources ranges as, moisture 24.75 to 29.38 per cent, total solids 70.62 to 75.25 per cent, fat 18.85 to 16.49 per cent protein 15.62 to 21.25 and acidity 0.72 to 0.95 per cent. Kumar and Das (2007) gave chemical composition of experimental samples of *Sandesh* as fat 18.9 per cent, protein 17.7 per cent, total sugar 33.3, ash 1.3 per cent and moisture 28.6 per cent and market sample

of *Sandesh* as fat 15.6 per cent, protein 19.3 per cent, total sugar 36.7 per cent, ash 2.1 per cent and moisture 26.2 per cent.

Mango pulp :

Desai (1992) found that Alphonso mango pulp contain 0.92 per cent fat, 33.75 per cent total solids and 0.46 per cent acidity. Dongale (2001) prepared *Kalakand* fortified with mango (*Mangifera indica* L.) pulp and reported the chemical composition of mango pulp as fat 0.87 per cent, total solids 30.73 per cent, acidity 0.42 per cent, total sugar 14.16 per cent, reducing sugar 4.45 per cent and non reducing sugar 10.51 per cent.

Dongale (2001) reported that the buffalo milk produced better quality of *Kalakand* as compared to cow milk. Moreover, it's per kg cost of preparation was less than cow milk *Kalakand* with mango pulp improved the sensory quality and acceptability of the product. The optimum level of mango pulp fortification of both the cow and buffalo milk *Kalakand* was found to be 15 per cent. Kote (2008) concluded that Alphonso mango pulp could be successfully utilized for preparation *Rasogolla*. The most acceptable quality of *Rasogolla* can be prepared by using 2.5 per cent mango pulp.

Singh *et al.* (2006) found that sensory score at different level of sugar during sensory evaluation revealed that the maximum score in each sensory attribute was obtained by the product prepared with 30 per cent sugar. *Sandesh* with 25 per cent had less sweetness, while with 35 per cent was sweeter. The extremes of sweetness in the product reduced acceptability significantly. Variation in level of sugar resulted in non-significant variation in the sensory scores for colour and appearance. Sugar levels significantly influenced the body and texture, sweetness and overall acceptability scores of *Sandesh*.

Lina Dubal (2009) reported the chemical composition of mango pulp as total solids, fat, protein and acidity were 29.33, 0.84, 0.87 and 0.42 per cent, respectively.

MATERIAL AND METHODS

The present M.Sc. work was carried out at the Department of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli, Dist. Ratnagiri (Maharashtra) during the year 2011-12.

Chhana, the intermeditory product for *Sandesh* preparation was prepared by procedure described by De

(1980) as per flow process diagram is given in Fig.A. *Sandesh* was manufactured by the procedure described by De (1980) with slight modifications. The detail flow process chart for preparation of *Sandesh* is given in Fig.B. Treatments: The sandeshs was prepared by incorporating the different levels of mango pulp. The detail treatment combination was T_0 : Control (No mango pulp), T_1 : Addition of mango pulp @7.5% of weight of *Chhana*, T_2 : Addition of mango pulp @15% of weight of *Chhana*, T_3 : Addition of mango pulp @22.5% of weight of *Chhana*, T_4 : Addition of mango pulp @30% of weight of *Chhana*, cane sugar was used @30 % of weight of *Chhana* for all treatments. Each treatment was replicated six times.

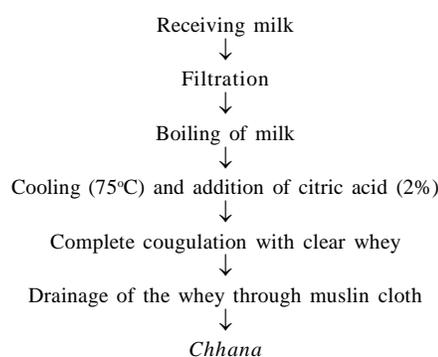


Fig. A: Flow process chart for preparation of *Chhana*

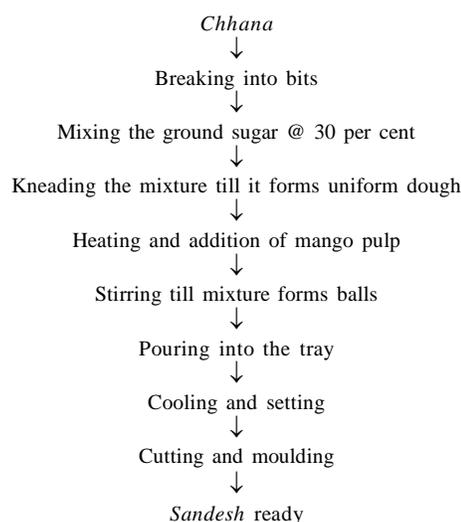


Fig. B: Flow process chart for preparation of *Sandesh*

Physico-chemical properties of *Sandesh* :

The physico-chemical properties of *Sandesh* developed by incorporang of mango pulp were

determined by the standard methods. Treatment wise representative samples of cow milk, *Chhana* and *Sandesh* were subjected to the chemical evaluation as below:

Total solids :

The per cent of total solids was determined by Gravimetric method as per IS 1479-2 (1961).

Fat :

The fat content was determined by using standard Gerber method as described by Choudhari (1959) with modification in strength of sulphuric acid.

Protein :

The protein content of *Sandesh* was determined by the Micro- Kjeldhal method as prescribed in A.O.A.C. (1970).

Acidity :

The acidity of *Sandesh* expressed as per cent lactic acid was determined according to the method described by Choudhari (1959) for *Cheese*.

Mango pulp :

The fat, total solids, protein content and acidity of mango pulp were determined as per the procedure given by Ranganna (1986).

Statistical design and analysis :

For the present investigation Randomized Block Design was employed using five treatments and six replications. The data were tabulated and analyzed according to the statistical methods prescribed by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The present investigation was undertaken to evaluate chemical and sensory quality of *Sandesh* by incorporation

with different levels of mango pulp. 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.

Chemical analysis of cow milk :

The fresh cow milk was analyzed for its chemical composition. The results are tabulated in Table 1. The chemical composition of cow milk is given in Table 2.

The figures in Table 1 revealed that cow milk used for the manufacture of *Sandesh* had on an average fat 4.13 per cent, total solids 13.13 per cent, acidity 0.14 per cent and protein 3.23 per cent. The values ranged within the limits of legal standards for cow milk in Maharashtra as prescribed by PFA rules, (1976), cited by De. (1980). The figures in Table 1 are in close agreement with the values given by Joshi *et al.* (1991) *i.e.* 4.22 per cent fat, 13.13 per cent total solids and 0.15 per cent titratable acidity and Mane (1999) *i.e.* 4.22 per cent fat, 12.95 per cent total solids and 0.14 per cent titratable acidity for cow milk available from the herd of College of Agriculture, Dapoli.

The Table 2 indicates that *Chhana* used for preparation of *Sandesh* had on average 23.38 per cent fat, 45.37 per cent total solid, 0.31 per cent acidity and 17.33 per cent protein. Average chemical composition of cow milk *Chhana* reported by Joshi *et al.* (1991) was 23.71, 54.76 and 17.28 per cent for fat, moisture and protein, respectively. Mane (1999) stated that *Chhana* contained 20.10 to 24.90 per cent fat, 42.73 to 45.98 per cent total solids, 0.27 to 0.41 per cent acidity. Further, Mane (2006) reported that cow milk *Chhana* contained 22.41, 45.03, 0.33 and 16.40 per cent fat, total solids, acidity and protein, respectively.

Chemical analysis of *Sandesh* :

The proximate analysis of *Sandesh* prepared by using different levels of mango pulp was carried out for fat, protein, acidity and total solids. The results and statistical analysis are furnished in Table 3.

Table 1 : Chemical analysis of cow milk (%)

Chemical parameter	Fat	Total solids	Acidity	Protein
Average	4.13	13.13	0.14	3.23

Table 2 : Chemical analysis of *Chhana* (%)

Chemical parameter	Fat	Total solids	Acidity	Protein
Average	23.38	45.37	0.31	17.33

Total solids :

The observations in respect of total solids content of *Sandesh* as influenced by different levels of mango pulp are presented in Table 3 and Fig. 1.

The observations of total solids are in close agreement with those of Mane (1999); Dure-Patil (1994)

and Singh *et al.* (2006) reported the chemical composition of *Sandesh* as 74.07 and 70.62 to 75.25 per cent, respectively. Average total solids content of *Sandesh* at different treatments is 75.27 (T_0), 74.30 (T_1), 73.31 (T_2), 72.35 (T_3) and 71.01 (T_4) per cent. The highest level of total solids (75.27) noticed in control (T_0) and lowest level

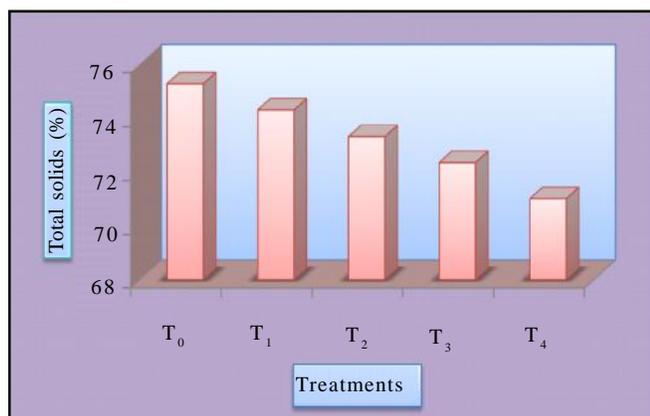


Fig. 1 : Effect of mango pulp on total solids of *Sandesh*

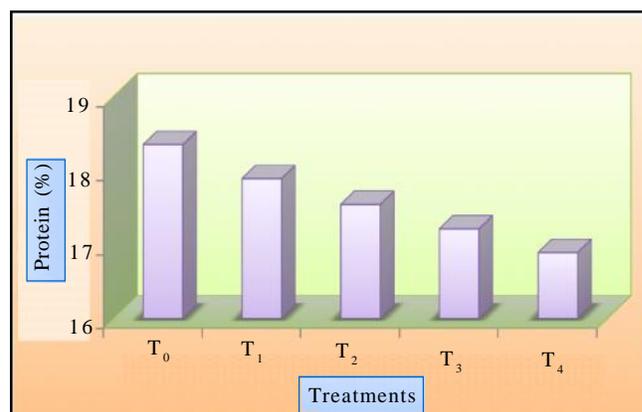


Fig. 3 : Effect of mango pulp on protein content of *Sandesh*

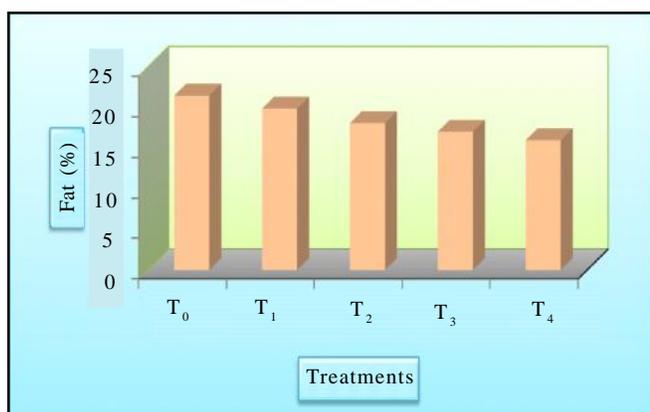


Fig. 2 : Effect of mango pulp on fat content of *Sandesh*

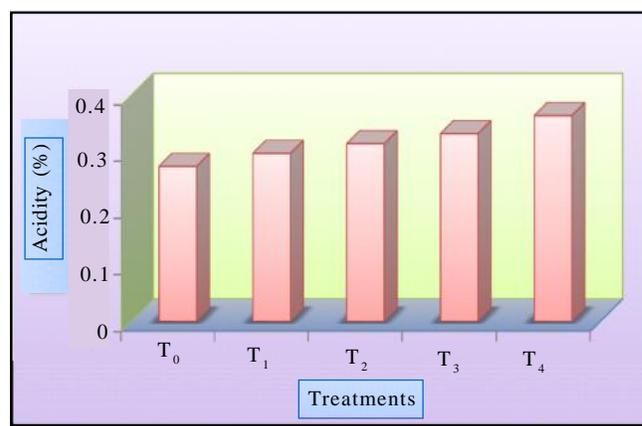


Fig. 4 : Effect of mango pulp on acidity of *Sandesh*

Table 3 : Effect of different levels of mango pulp on physico-chemical quality of *Sandesh* (%)

Treatments	Chemical parameter			
	Fat	Total solids	Acidity	Protein
T_0	21.50	75.27	0.275	18.35
T_1	19.89	74.30	0.298	17.89
T_2	18.11	73.31	0.315	17.54
T_3	17.05	72.35	0.333	17.21
T_4	16.00	71.01	0.365	16.89
Mean	18.51	73.25	0.317	17.58
S.E.±	0.262	0.231	0.004	0.074
C.D. (P=0.05)	1.052**	0.925**	0.017**	0.30**

** Indicate significance of value at $P < 0.01$

of total solid noticed in T_4 treatment *i.e.* 30 per cent level of mango pulp. It was observed that the total solids content decreased with the increase in level of mango pulp.

Fat :

Data pertinent to the fat content in *Sandesh* with the addition of mango pulp at different levels are presented in Table 3 and Fig. 2. The perusal of data revealed that the variation in the fat content of *Sandesh* due to different levels of mango pulp was found to be significant. The fat content decreased significantly with the increase in the level of mango pulp. The average fat content of *Sandesh* at 7.5, 15, 22.5 and 30 per cent level of mango pulp was 21.50 (T_0), 19.89 (T_1), 18.11 (T_2), 17.05 (T_3) and 16.00 (T_4) per cent, respectively.

It was observed that as the level of mango pulp increased the fat content was decreased simultaneously which may be due to very low fat content of mango pulp (0.85%). The variation of fat content of *Sandesh* due to different treatments remains statistically significant at 1 per cent level of significance. The fat content of *Sandesh* without mango pulp (T_0) was 19.33 to 22.66 per cent and these values are in close agreement with Mugdha (1989); Sen and Rajohria (1991); Dure-Patil (1994) and Mane (1999) who reported 21.21 to 23.21, 19.82, 20.23 and 19.50 to 24.40 per cent fat, respectively. The highest (21.50%) fat content in *Sandesh* was observed at control *i.e.* *Sandesh* without addition of mango pulp and lowest (16.00%) at T_4 treatment *i.e.* 30 per cent level of mango pulp.

Protein :

The data pertaining to the protein content in *Sandesh* with addition of mango pulp at different levels are presented in Table 3 and Fig. 3.

It is revealed from Table 3 that mean protein content in *Sandesh* sample under different treatments ranging from 16.89 to 18.35 per cent under various treatments which is very close to that reported by Sen and Rajorhia (1991); Mahuya Bandyopadhyay *et al.* (2006); Singh *et al.* (2006) and Kumar and Das (2007) as 16.79 to 18.21, 16.34 to 23.80, 16.49 to 18.85 and 19.30, respectively. Protein content of *Sandesh* was highly significant due to addition of pulp. It was decreased with the increase in the level of pulp which may be due to its very low protein content (0.87%). The values are of 18.35 (T_0), 17.89 (T_1), 17.54 (T_2), 17.21 (T_3) and 16.89 (T_4) per cent for protein content at 0, 7.5, 15, 22.5 and 30 per cent addition

of mango pulp, respectively.

Acidity :

The observations in respect of titratable acidity of *Sandesh* as influenced by addition of mango pulp are given in Table 3 Fig. 4.

From Table 3 it was observed that the addition of mango pulp (T_0 , T_1 , T_2 , T_3 and T_4) resulted in slight increase in acidity of *Sandesh* (*i.e.* 0.275, 0.298, 0.315, 0.333 and 0.365, respectively). However, this increase in acidity was statistically significant. The results of present investigation in respect of acidity are well comparable with the acidity of *Sandesh* reported by Mugdha (1989); Dure-Patil (1994) and Mane (1999) as 0.28 to 0.32, 0.24 and 0.22 to 0.36 per cent, respectively. Mango pulp possessed 0.42 per cent titrable acidity as presented in Table 3. The highest acidity of *Sandesh* (0.365) was observed in treatment T_4 *i.e.* 30 per cent level of mango pulp and lowest (0.275) at control *i.e.* *Sandesh* without mango pulp.

Conclusion :

It is concluded from the present investigation that, the cow milk used for *Sandesh* preparation contained on an average 4.13 per cent fat, 13.13 per cent total solids, 3.23 per cent protein and 0.14 per cent acidity. *Chhana* used for *Sandesh* preparation contained on an average 23.38 per cent fat, 45.37 per cent total solids, 17.33 per cent protein and 0.31 per cent acidity.

Total solids content of *Sandesh* decreased significantly with increase in the level of mango pulp. The average values for control, 7.5, 15, 22.5 and 30 per cent levels of mango pulp were 75.27, 74.30, 73.31, 72.35 and 71.01 per cent total solids, respectively. With the increase in the level of mango pulp, there was significant decrease in fat content of *Sandesh* protein content of *Sandesh* varied significantly with the values of 18.35, 17.89, 17.54, 17.21 and 16.89 per cent at control, 7.5, 15, 22.5 and 30 per cent level of mango pulp, respectively. With the increase in the level of mango pulp, there was significant decrease in protein content of *Sandesh*. Where as With the increase in the level of mango pulp, there was significant increase in acidity of *Sandesh*.

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