Studies on sensory characteristics of *Sandesh* by incorporating with mango pulp (*Mangifera indica* L.) cv. ALPHONSO

V. N. PATIL, R. M. KADAM, SONALI JADHAV AND A. A. HANMANTE

ABSTRACT : *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 sesory characteristics were determined. It is concluded, the cow milk *Chhana* best for *Sandesh* preparation. Sensory characteristics *i.e.* colour and appearance, flavour, body and texture *of Sandesh* was done using hedonic rating scale then it is concluded that score increasing with addition of mango pulp upto 22.5 per cent level of mango pulp (T_3) then decline significantly with increase in the level of mango pulp. From the results of present investigation it may be concluded that mango pulp could be successfully utilized for preparation of *Sandesh*. Addition of mango pulp in cow milk *Sandesh* improved sensory quality and acceptability of the product. For incorporation of *Sandesh* the optimum level of mango pulp found to be 22.5 per cent on the basis of weight of *Chhana*.

KEY WORDS : Cow milk, *Chhana*, Sensory evaluation, Mango pulp, Statistical analysis

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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 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, reheology and

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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 flavour with soft and cohesive body, smooth texture with small size grains (Sen and Rajorhia, 1985 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 sensory charateristics of *Sandesh* with different level of mango pulp

– To standardize the manufacturing technology of *Sandesh* incorporated with mango pulp

– To cost of *Sandesh* production.

Rajorhia and Sen (1988) described traditional method of production of *Chhana* which is prepared by boiling about 20-40 liter of the cow milk or mixed milk in an karahi to about 80-85℃ 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) and Rahate (1993). Filtered milk was then taken transferred to stainless steel vessel and heated to 90℃. Steaming was discontinued and temperature of milk was lower to 80℃ followed by gradual addition of citric acid solution 1.5% (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*.

Badyopadhay (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.

Sensory charateristics :

Sen and Rajorhia (1991) observed that the milk with less than 4 per cent fat produces *Sandesh* with dry and weak body and coarse texture. They also recommended that while mixing with sugar *Chhana* should be added in the installments rather than only as one lot to get desirable soft body and smooth texture of the product.

Sen and Rajorhia (1994) found that use of 0.015 per cent of saffron by weight of *Chhana* considerably improved the flavour of *Sandesh*.

Mane (1999) studied that sensory evaluation of cow milk *Sandesh*, goat milk *Sandesh* and mixed milk *Sandesh*. Cow milk *Sandesh* recorded highest score for general appearance, body and texture, flavour and overall acceptability which was with use of goat milk upto 50 per cent. Highest proportion of goat milk significantly lowers the score.

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.

Patel *et al*. (2006) concluded that there was no significant difference in flavour, colour and appearance score of controlled and experimental *Sandesh*. The body texture of final product was greatly influenced by the loading of *Chhana*-sugar mixture, speed of the scraper assembly and initial moisture content in *Chhana*. It is inferred that the batch size of 2kg *Chhana*, scraper speed of 70 rpm and moisture content between 60 to 65 per cent yield better product in the SSHE (Scraped Surface Heat Exchanger) of the present study.

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*.

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.

MATERIAL AND METHODS

The present M.Sc.(Ag) work was carried out at the Department of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli- 415 712 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.
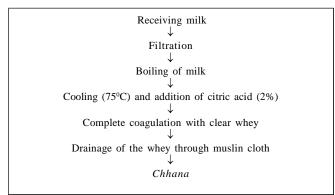
Receiving milk
↓
Filtration
↓
Boiling of milk
↓
Cooling (75^{0}C) and addition of citric acid (2%)
↓
Complete coagulation with clear whey
↓
Drainage of the whey through muslin cloth
↓
Chhana

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

Chhana
↓
Breaking into bits
↓
Mixing the ground sugar @ 30%
↓
Kneading the mixture till it forms uniform dough
↓
Heating and Addition of mango pulp
↓
Stirring till mixture forms balls
↓
Pouring into the tray
↓
Cooling and setting
↓
Cutting and moulding
↓
Sandesh ready

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

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 *Sandesh* 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.

Sensory evaluation of *Sandesh* :

The fresh samples of *Sandesh* were subjected to organoleptic evaluation by a panel of judges. The product for sensory characteristics such as colour and appearance, flavour, body and texture was evaluated. The judges (Not less than six) were provided with hedonic scale scorecard suggested by Amerine *et al*. (1965).

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). The sensory score data of different treatments was analyzed statistically by Freidman's test (Rangaswamy, 2010). The data arrangement is similar to that for Quade test. The treatments within the block are ranked from 1 to *n* in the usual manner. Then the ranks r_{ij} for each treatment is summed to obtain *Rj*.

To test the Null hypothesis that treatments have identical effects, we use test statistic,

$$F_2 = \frac{(b-1)\left[B - \frac{bn(n+1)^2}{4}\right]}{E}$$

where,

E = A − B

A = $\sum\sum r_{ij}^2$

B = $\frac{1}{b} \sum R_j^2$

$R_j = \sum r_{ij}$ for treatment j,

b = number of blocks,

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n = number of treatments.

The test statistic, F_2 is approximately distributed as F with n-1 and (b-1) (n-1) degrees of freedom.

If the Friedman test results in rejection of the null hypothesis then multiple comparisons are made. For this we compute the critical difference,

$$C.D. = t \sqrt{\frac{2bE}{(b-1)(n-1)}}$$

Here t is the critical value of t for (b-1)(n-1) degrees of freedom and the specified level of significance. If the absolute difference $R_i - R_j$ for treatments i and j is greater than the critical difference, the treatments are considered to be significantly different.

RESULTS AND DISCUSSION

The present investigation was undertaken to evaluate 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.

Sesory charateristics of *Sandesh* :

The proximate analysis of *Sandesh* prepared by using different levels of mango pulp was carried out for colour and appearance, flavour, body and texture and overall acceptability. The results and statistical analysis are furnished in Table 1.

Colour and appearance:

Table 1 and Fig. 1 shown that the highest score for colour and appearance recorded at T_3 (8.02) *i.e. Sandesh* with 22.5 per cent mango pulp and obtained rank first and lowest score at T_0 (6.89) *i.e. Sandesh* with without mango pulp and obtain rank fifth. Score increased upto 22.5 per cent level of mango pulp and declined, thereafter,
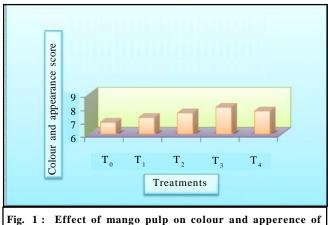

Fig. 1 : **Effect of mango pulp on colour and apperence of** *Sandesh*

slightly at T_4 *i.e. Sandesh* with 30 per cent level of mango pulp.

Body and texture:

Table 1 and Fig. 2 shown that tn the case of body and texture the *Sandesh* prepared with 22.5 per cent level of mango pulp (T_3) and gain rank first recorded the highest score of 7.98 and lowest score of 6.83 at *Sandesh*
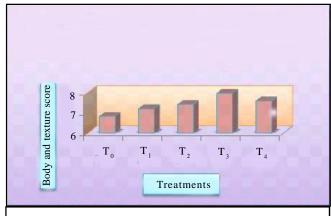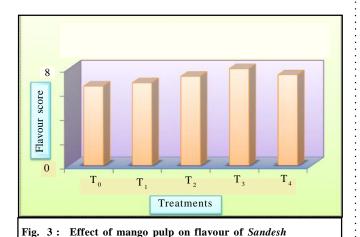

Fig. 2 : **Effect of mango pulp on body and texture of** *Sandesh*

Table 1: Effect of different levels of mango pulp on sesory charateristics of *Sandesh*

Treatments	Sensory pararmeter							
	Colour and appearance		Flavour,		Body and texture		Overall acceptability	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
T_0	6.89	5	6.55	5	6.83	5	6.58	5
T_1	7.25	4	6.82	4	7.20	4	7.08	4
T_2	7.60	2	7.35	3	7.42	3	7.45	3
T_3	8.02	1	7.99	1	7.98	1	7.99	1
T_4	7.74	3	7.48	2	7.59	2	7.46	2
C.D. (P=0.01)	8.72	---	8.05	----	10.10	---	8.72	----

prepared with without mango pulp (T_0). Score increased upto 22.5 per cent level of mango pulp declined, thereafter, slightly (7.59) at T_4 *i.e. Sandesh* with 30 per cent level of mango pulp.

Flavour:

Table 1 and Fig. 3 shown that in case of flavour the *Sandesh* with 22.5 per cent mango pulp (T_3) recorded highest score of 7.99 and obtained rank first followed by *Sandesh* with 30 per cent mango pulp (7.48) and lowest score of 6.55 at *Sandesh* without mango pulp obtained rank fifth. Score increases upto 22.5 per cent level of mango pulp and, thereafter, declined slightly at T_4 *i.e. Sandesh* with 30 per cent level of mango pulp.
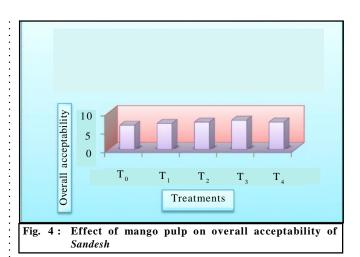

Fig. 3 : Effect of mango pulp on flavour of *Sandesh*

Overall acceptability:

Table 1 and Fig. 4 shown that most acceptable product in the present study was observed to be *Sandesh* prepared by using 22.5 per cent mango pulp (T_3) and gain rank first which was significantly superior amongst all treatments with overall acceptability score of 7.99 followed by *Sandesh* with 30 per cent mango pulp, with score of 7.46, while lowest score (6.58) was obtained by *Sandesh* prepared without mango pulp (T_0). Score increased upto 22.5 per cent level of mango pulp and declined, thereafter, slightly at T_4 *i.e. Sandesh* with 30 per cent level of mango pulp.

Cost of production of *Sandesh*:

One of the main objectives of present study was to

Fig. 4 : Effect of mango pulp on overall acceptability of *Sandesh*

study the effect of mango pulp on cost of *Sandesh* preparation. The cost of production for the *Sandesh* preparation was worked out by considering the prevailing retain cost of ingredients only. In calculating the cost of production for *Sandesh*, the cost of labour, fuel, electricity and depreciation on equipment were not considered as the cost on all there aspects was same for all treatments. From the Table 2 and Fig.5 it is observed that *Sandesh* prepared by using various level of mango pulp was slightly costly as compared to that prepared without addition of mango pulp.

Cost of production for preparing one kg of *Sandesh* from cow milk was Rs. 176.09, Rs.180.35, Rs. 184.94, Rs. 185.93 and Rs. 188.46 for 0, 7.5, 15, 22.5 and 30 per
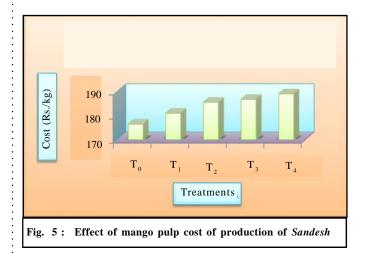

Fig. 5 : Effect of mango pulp cost of production of *Sandesh*

Table 2 : Effect of mango pulp on production cost of *Sandesh*					
Treatments	T_0	T_1	T_2	T_3	T_4
Cost (Rs./kg)	176.09/-	180.35/-	184.94/-	185.93/-	188.46/-

cent levels of mango pulp, respectively. The production cost of most acceptable *Sandesh* (T$_3$) was Rs.185.93 per kg.

Conclusion:

From the results of present investigation it may be concluded that mango pulp could be successfully utilized for preparation of *Sandesh*. Addition of mango pulp in cow milk *Sandesh* improved sensory quality and acceptability of the product. For incorporation of *Sandesh* the optimum level of mango pulp found to be 22.5 per cent on the basis of weight of *Chhana*. The production cost of most acceptable *Sandesh* (T$_3$) was Rs. 185.93 per kg.

LITERATURE CITED

Amerine, M.A., Ponhorn, R.M. and Rossiser, R.B. (1965). *Principle of sensory evaluation of food*. American Press, LONDON, UNITED KINGDOM.

Aneja, R.P. (1997). *Traditional dairy delicacies*. Dairy India, 5th Ed. pp. 379.

Aneja, R.P., Mathure, B.N., Chandan, R.C. and Banarjee, A.K. (2002). *Technology of Indian milk product*. A Dairy India Publication, DELHI, INDIA.

Bandyopadhay, P. (2006). Tecnological advancement on traditional Indian desiccated and heat-acid coagulated dairy product. *Indian Dairyman,* **58** (11): 59.

De, S. (1980). *Outlines of dairy technology*, Oxford University, Press, NEW DELHI, INDIA.

Dongale, Archana (2001). Preparation of kalakand fortified with mango (*Mangifera indica* L.) pulp cv. ALPHONSO. M.Sc.(Ag.) Thesis, Dr. Balasheb Savant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, M.S. (INDIA).

Kalalselvi, P. and Somasundaram, M. (2011). World wide dairy development-At a glance. *Indian J. Mktg.,* **41** (7): 43.

Kote, D.P. (2008). Preparation of rasogolla blended with mango (*Mangifera indica* L.) pulp cv. ALPHONSO. M.Sc.(Ag.) Thesis, Dr. Balasheb Savant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, M.S. (INDIA).

Mane, A.B. (1999). Utilization of goat milk for preparation of *Sandesh*. M.Sc.(Ag.) Thesis, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, M.S. (INDIA).

Mane, J.R. (2006). Studies on manufacture of *Chhana* podo. M.Sc.(Ag.) Thesis, Dr. Balasheb Savant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, M.S. (INDIA).

Patel, J.S., Bhadania, A.G. and Boghra V.R. (2006). Chemical composition and sensory evaluation of *sandesh* manufacture in scraped surface heat exchanger (SSHE). *J. Dairying Food &H.S.,* **25** (1): 28.

Rajorhia, G.S. and Sen, D.C. (1988). Technology of *Chhana*, A review. *Indian J. Dairy Sci.,* **41**(2) :141.

Rangaswamy, R. (2010). *A textbook of Agriculture statistics,* II nd Ed. New age International Publication.139pp.

Sahu, J.H. and Das, H. (2007). *Chhana manufacturing*. Indian Dairy Association (IDA) Monograph, 003/TE/2007, New Dehli, India, 1-20pp.

Sahu, J.K. (2007). Process and machinery development for production of *Sandesh*- An Indian dairy product. Ph.D. Thesis, Indian Institute of Technology Kharagpur, U.P. (INDIA).

Sen, D.C. and Rajorhia,G.S.(1991a). Effect of replacement of cane sugar with corn syrup on sensory and chemical properties of *sandesh*. *Indian J. Nutr. Dietet.,* **28** : 309.

Sen, D.C. and Rajorhia, G.S. (1991b). Production of narampak *Sandesh* from buffalo milk. *J. Food Sci. & Technol.,* **28**(6):359.

Sen, D.C. and Rajorhia, G.S. (1994). Role of saffron in improving storage quality of *Sandesh*. *Indian J. Dairy Sci.,* **47**(3):198.

Shelke, R.R., Khedkar, C.D. and Pande, S.P. (2002). Effect of acid value of *Chhana* on quality of rasogolla. *Indian J.Dairy Sci.,* **55** (1): 51.

Singh, G.P. and Ray, T.K. (1977). Effect of milk coagulants on the quality of *Chhana* and *Chhana* whey. *J. Food Sci. & Technol.,* **14** : 205.

Singh, N.G., Murthy, P.R.S. and Reddy, Y.K. and Reddy, V.P.N. (2006). Optimization of ingradient for production of milk sweetmeat *Sandesh*. *Indian Dairyman,* **59** (6): 359.

Snedecor, W.G. and Cochran, G.W. (1994). *Statistical methods,* 8th Ed. The Iowa State University Press, Ames, Iowa.

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