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## Microbiological quality of herbal sandesh from a blend of cow milk and soy milk fortified with Moringa (*Moringa oleifera*) and Roselle (*Hibiscus sabdariffa*) leaves at ambient temperature

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**Abstract**

In the present study Herbal Sandesh, a chhana-based popular sweet delicacy of the eastern part of India, especially in West Bengal, is prepared from blend of cow milk and soy milk fortified with Moringa and Roselle leaf that showed microbiological properties. Moringa (*Moringa oleifera*) and Roselle (*Hibiscus Sabdariffa*) are popular medicinal plant that helps to improve microbial quality of dairy products. The present study was carried out to find out the microbiological analysis such as Standard Plate count, Coliform count, Yeast and mould with herbal extract inclusion in the Sandesh. The addition of herbs @ 1%, 2%, 3% decreased the SPC and Yeast and Mould, where as in the present investigation coliform count were found to be absent in all the samples (0, 5, 10 and 15 days). This indicates that proper hygienic precautions had been taken during the production and packaging of Herbal Sandesh. The result found that best result in SPC and Yeast and mould count at 0,3,5 day 7 of herbal Sandesh blended of cow milk and soy milk fortified with Moringa @ 3% and Roselle @ 3% herbs extract respectively in selected Sandesh compared to @ 0% used of herb in Sandesh.

**Keywords:** Soy milk, cow milk, chhana, roselle, moringa, sandesh, microbial analysis

**Introduction**

Sandesh is a very popular and chhana based sweet of eastern India. There is a custom prevailing in West Bengal that whenever good message (Sandesh) is sent to relatives and friends, at least one sweet of exquisite quantity should accompany the messenger. Sandesh is the common sweet carried by the visitors at such occasions. The sweet besides being palatable is also a rich source of milk proteins, fat and fat soluble vitamins like A, D, E, and K.

Traditionally Sandesh is prepared by Halwais on a small scale. Three kinds of *Sandesh available* in market, Karapak, Narampak and Kacchagola. Narampak is the most popular variety.

**The national commission on Agriculture (1976)**

Cow milk chhana is usually preferred for sandesh making because of its soft body, smooth texture and small grains. Chhana is an indigenous milk product obtained by acid coagulation of hot milk followed by drainage of major quantity of water as whey. The acid commonly used are lactic or citric acid both in natural or chemical form. *Chhana* used as base material for the preparation of variety of sweetmeats like *sandesh*, *rosogolla*, *cham cham*, *rasmalai*, *pantooa*, *chhanapodo* etc. Traditional method of *sandesh* making involves preparation of *chhana*, mixed with sugar (30-35% of chhana), kneaded and cooked at 70-75 °C for 10-15 minutes. The cooked mass is transferred to moulds for desirable shape.

Sandesh product is considered a delicacy and commands a much higher price. This is normal quality sandesh and has a longer shelf-life than the second type which is softer and is more expensive. It is made from fresh chhana. Chemical composition of Sandesh from buffalo milk, Moisture-27.14%, Fat-18.42%, Protein-18.71%, Sugar-33.83%, Ash-1.90%. This is normal quality sandesh and has a longer shelf-life than the second type which is softer and is more expensive (Parekh, 1994) [10].

The soybean (*Glycine max*), legume family could be a native crop of eastern Asia (Amanze 2011) [3]. Soybean is said to have originated in China about 5,000 years ago, with a Chinese emperor being the first to exploit the plant (Al-Bakkush and Al-Amari, 2008) [2]. Its cultivation spread throughout the globe and the share of India is fourth to the planet soybean production. Because the world population expands, there'll be a greater pressure for the consumption of plant products (Kinsella, 1979) [9].

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Soy milk is made by soaking soybeans, grinding them with water. The fluid which results after straining is called soy milk. You can make soy milk at home with basic kitchen tools or with a soy milk machine. Soy milk is most commonly found in aseptic cartons. Most of the soy milk available in the market is flavoured and fortified with extra calcium or vitamins. Soymilk is an excellent source of high quality protein and B-vitamins. Soymilk is not a rich source of calcium, this is way most commercial soymilk products are fortified with calcium. Soy protein is highly digestible (92 to 100%) and contains all essential amino acids. Soy protein products contain high concentration (up to 1 g/kg) of isoflavones that exerts protective properties against breast, prostate, colon and lung cancers (Gupta, 2010) [7].

Moringa oleifera is valued for its multiple economic, medicinal and nutraceutical properties worldwide. This plant has been honoured as Botanical of the Year–2007 by the National Institute of Health (NIH). The Africans accustomed call it Never Die! or Miracle Tree! for its ability to treat over 300 diseases (Swathi *et al.*, 2018) [11].

All parts of the Moringa tree (leaves, seeds, roots and flowers) are suitable for human and animal consumption. Moringa is helpful for human still as animal consumption also. Moringa is employed for the treatment of home scale medicine (Leone *et al.*, 2015).

Roselle (*Hibiscus sabdariffa* L.) seed could be a valuable food resource because of its rich in protein content and micronutrients. it's also a superb source of fibre (Omabuwajo *et al.* 2000).

Roselle is one in all the foremost important and popular medicinal plants. Roselle is an Indian and Malaysian native flower, where it is widely farmed, and it must be sent to Africa as soon as possible. The seeds are said to be utilised for oil in various regions of Africa. Protein, dietary fibre, carbs, and lipids are all said to be abundant in the seeds (Abu-Tarboush *et al.*, 1997) [1].

## Material and Method

The present study has been carried out in the research Lab, Warner College of Dairy Technology, SHUATS, Prayagraj,

U.P. (India). All the raw materials were collected from the local market of Allahabad. Potable water was used for preparing the product. It was ensured that the materials used were free from any kind of infection.

**Herbs:** Roselle and Moringa dried leaves were purchased from Prayagraj.

## Preparation of herbal water extract

Herbal water extract was prepared by soaking each herb in distilled water (1:10) overnight followed by centrifugation (2000 rpm; 15 min at 40 °C). The supernatant was harvested and refrigerated and used in the preparation of Herbal Sandesh.

## Preparation of chhana

The method adopted to prepare chhana in this study was according to the method given by Bhattacharya *et al.*, (1971) [5] with slight modification. The standardized buffalo milk was heated up to 75 °C. The freshly prepared coagulant solution was heated to 75 °C and then added slowly in a thin continuous stream with continuous gentle agitation till a clear whey separated out. Stirring was then stopped and the curd was allowed to remain in whey for about 5 minutes. It was then drained through a hang with muslin cloth (10 min) and stored for future use.

## Preparation of herbal Sandesh

Fresh chhana and herbs (table 1) was kneaded thoroughly to make a uniform dough. Fine powdered cane sugar (300 g) was added to the dough' and was kneaded again. The dough was then heated (75 °C) in an iron pan with continuous stirring. Heating was continued until the mixture acquired desired consistency with slightly cooked flavored. During the final stages of heating, the mixture developed slight cooked flavor and the sticking tendency to the pan disappeared. The cooking was completed in 15-20 min. The products were then transferred to a shallow pan, cooled and sliced into desired shapes. Thus, final product obtained and packed in plastic box for storage at room temperature (25+ 5 °C).

**Table 1:** Ingredients Used in the Preparation of Herbal Sandesh for 1 Kg

Sr. No.	Treatment	Cow Milk	Soy Milk	Chhana (80:20) in (gm)	Rosella Leaves Extract (gm)	Moringa Leaves Extract (gm)	Total
1	R <sub>0</sub> M <sub>0</sub>	100		1000	00	00	1000
2	R <sub>0</sub> M <sub>1</sub>	99		990	00	00	1000
3	R <sub>0</sub> M <sub>2</sub>	98		980	00	00	1000
4	R <sub>0</sub> M <sub>3</sub>	97		970	00	00	1000
5	R <sub>1</sub> M <sub>0</sub>	99		990	01	10	1000
6	R <sub>1</sub> M <sub>1</sub>	98		980	01	10	1000
7	R <sub>1</sub> M <sub>2</sub>	97		970	01	10	1000
8	R <sub>1</sub> M <sub>3</sub>	96		960	01	10	1000
9	R <sub>2</sub> M <sub>0</sub>	98		980	02	20	1000
10	R <sub>2</sub> M <sub>1</sub>	97		970	02	20	1000
11	R <sub>2</sub> M <sub>2</sub>	96		960	02	20	1000
12	R <sub>2</sub> M <sub>3</sub>	95		950	02	20	1000
13	R <sub>3</sub> M <sub>0</sub>	97		970	03	30	1000
14	R <sub>3</sub> M <sub>1</sub>	96		960	03	30	1000
15	R <sub>3</sub> M <sub>2</sub>	95		950	03	30	1000
16	R <sub>3</sub> M <sub>3</sub>	94		940	03	30	1000

**Note:** Sugar use for all Treatment: 300 gm (30.0% of total wt.)

## Results and Discussion

The studies were conducted on the assessment of microbial analysis of the Herbal Sandesh. The findings are tabulated in Table-2.

**Table 2:** Microbial analysis of Herbal Sandesh (Mean Value in percentage)

Treatment	SPC ( $\times 10^4$ cfu/gm)				Yeast and mould (per gm)				Coliform count			
	0	3	5	7	0	3	5	7	0	3	5	7
zR <sub>0</sub> M <sub>0</sub>	7.2	15.74	28.62	34.678	0	5.64	17.4	29.64	0	0	0	0
zR <sub>0</sub> M <sub>1</sub>	4.6	10.492	19.076	33.176	0	3.26	8.16	16.94	0	0	0	0
zR <sub>0</sub> M <sub>2</sub>	4.2	8.62	15.676	28.700	0	1.82	7.18	14.9	0	0	0	0
zR <sub>0</sub> M <sub>3</sub>	3.6	8.332	15.116	26.500	0	0.7	4.92	9.5	0	0	0	0
zR <sub>1</sub> M <sub>0</sub>	5	10.25	18.646	33.280	0	2.64	7.64	14.74	0	0	0	0
zR <sub>1</sub> M <sub>1</sub>	4.6	9.462	17.204	31.040	0	1.16	6.64	12.84	0	0	0	0
zR <sub>1</sub> M <sub>2</sub>	3.8	7.564	13.752	24.500	0	0.44	5.64	11.66	0	0	0	0
zR <sub>1</sub> M <sub>3</sub>	3.4	7.042	12.812	23.180	0	0	3.88	8.22	0	0	0	0
zR <sub>2</sub> M <sub>0</sub>	4.6	8.542	14.736	25.260	0	1.08	4.88	12.28	0	0	0	0
zR <sub>2</sub> M <sub>1</sub>	4	8.174	14.094	24.120	0	0.22	4.5	8.54	0	0	0	0
zR <sub>2</sub> M <sub>2</sub>	3.2	5.812	10.032	17.140	0	0	3.42	7.6	0	0	0	0
zR <sub>2</sub> M <sub>3</sub>	2.8	4.412	6.306	8.880	0	0	3.22	5.68	0	0	0	0
zR <sub>3</sub> M <sub>0</sub>	4	5.952	10.262	17.580	0	0.38	3.36	7.86	0	0	0	0
zR <sub>3</sub> M <sub>1</sub>	3.8	5.442	9.402	16.240	0	0	2.76	6.4	0	0	0	0
zR <sub>3</sub> M <sub>2</sub>	3	3.824	5.466	7.600	0	0	2.4	5.22	0	0	0	0
zR <sub>3</sub> M <sub>3</sub>	2	2.592	3.71	5.140	0	0	1.76	5.02	0	0	0	0

**Microbial analysis of Herbal Sandesh****SPC count in Herbal Sandesh at 0 day**

The highest mean in SPC ( $\times 10^4$  CFU/gm) at zero day of Herbal Sandesh was obtained in treatment R<sub>0</sub>M<sub>0</sub> (7.2) while R<sub>3</sub>M<sub>3</sub> recorded the minimum (2).

**SPC count in Herbal Sandesh at 3 days**

The highest mean in SPC ( $\times 10^4$  CFU/gm) at 3<sup>rd</sup> days of Herbal Sandesh was obtained in treatment R<sub>0</sub>M<sub>0</sub> (15.74) while R<sub>3</sub>M<sub>3</sub> recorded the minimum (2.592).

**SPC count in Herbal Sandesh at 5 days**

The highest mean in SPC ( $\times 10^4$  CFU/gm) at 5<sup>th</sup> days of Herbal Sandesh was obtained in treatment R<sub>0</sub>M<sub>0</sub> (28.62) while R<sub>3</sub>M<sub>3</sub> recorded the minimum (3.71).

**SPC count in Herbal Sandesh at 7 days**

The highest mean in SPC ( $\times 10^4$  CFU/gm) at 7<sup>th</sup> days of Herbal Sandesh was obtained in treatment R<sub>0</sub>M<sub>0</sub> (34.67) while R<sub>3</sub>M<sub>3</sub> recorded the minimum (5.140).

**Yeast and Mold count in Herbal Sandesh at 0 day**

Mean in values of yeast and mould count (per gm) of Herbal Sandesh at 0 day was nil.

**Yeast and Mold count in Herbal Sandesh at 3 days**

The highest mean in Yeast and mold (per gm) count at 3<sup>rd</sup> days of Herbal Sandesh was obtained in treatment R<sub>0</sub>M<sub>0</sub> (5.64) while R<sub>1</sub>M<sub>3</sub>, R<sub>2</sub>M<sub>2</sub>, R<sub>2</sub>M<sub>3</sub>, R<sub>3</sub>M<sub>1</sub>, R<sub>3</sub>M<sub>2</sub> and R<sub>3</sub>M<sub>3</sub> recorded the minimum (0.0).

**Yeast and Mold count in Herbal Sandesh at 5 days**

The highest mean in Yeast and mold (per gm) count at 5<sup>th</sup> days of Herbal Sandesh was obtained in treatment R<sub>0</sub>M<sub>0</sub> (17.4) while R<sub>3</sub>M<sub>3</sub> recorded the minimum (1.76).

**Yeast and Mold count in Herbal Sandesh at 7 days**

The highest mean in Yeast and mold (per gm) count at 7<sup>th</sup> days of Herbal Sandesh was obtained in treatment R<sub>0</sub>M<sub>0</sub> (29.64) while R<sub>3</sub>M<sub>3</sub> recorded the minimum (5.02).

**Coliform count in Herbal Sandesh**

In the present investigation coliform count were found to be absent in all the samples (0, 3, 5 and 7 day). This indicates that proper hygienic precautions had been taken during the production and packaging of Herbal Sandesh.

**Conclusion**

Quality of sandesh from blend of cow milk and soy milk could be improved through incorporation of medicinal Herbs such as Moringa and Roselle into milk prior to manufacture. Microbial properties were analyzed in terms of SPC, yeast and mold and coliform. The results of the present study revealed that the inclusion of herbs in the Herbal Sandesh @1%, 2%, 3% level of Moringa and Roselle combination of herbs. The best sample incorporated with the Moringa and Roselle @ 3% Herbs produced better results in Microbial properties of blend of cow milk and soy milk sandesh compared to control. The evidence from this study suggests that Herbs additives in Herbal Sandesh increased the acceptability of Sandesh.

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