



Proximity analysis and sensory characteristics of soya dates sandesh

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Abstract

Sandesh represents the traditional Indian dairy product used as sweet dairy desserts, prepared by acid and heat coagulation of milk. It is popular throughout eastern part of India especially in West Bengal. Sandesh of many varieties is manufactured and sold in the country. Therefore aim of our study was to innovatively formulate the traditionally prepared sweet- “sandesh” into a nutrient dense “soya dates sandesh”. Nutritional value of this traditional sweet was enriched through the addition of soya milk paneer, dates and honey. This could also meet the needs of health conscious consumers. Soya milk was extracted from soya beans for the preparation of soya paneer and cow’s milk was used to prepare milk paneer. Three products were prepared, Control (C0) - Paneer with sugar and 2 variations of cow milk paneer with soya milk paneer was formulated (Variation 1-3:1 and Variation 2-1:1). Proximity analysis was determined and sensory evaluation was done among a panel of 10 members using a 9 point hedonic scale. From the study it was noted that protein and moisture content of the soya dates sandesh increased significantly as soya milk paneer was substituted at 25% and 50% to cow milk paneer whereas, fat content reduced from 14.1% in control to 8.42% in variation 2. This was statistically significant. Sensory attributes of cow milk paneer and soya milk paneer showed a significant difference in all the attributes ($p>0.05$) except texture when compared with the control. Hence present study showed that nutritious soya dates sandesh can be developed by substituting 25% of soya milk paneer to cow milk paneer; which was better accepted and also maintained the organoleptic properties of sandesh.

Keywords: traditional sweet sandesh, paneer, soya dates sandesh, control- C0, variation 1-V1, variation 2-V2

Introduction

Soybean (*Glycine max* L. Merrill) is the world’s most important seed legume, which contributes to 25% of the global edible oil, about two-thirds of the world’s protein concentrate for livestock feeding. Soybean has established itself as a major rainy season crop in the rain fed agro-ecosystem of central and peninsular India [1]. Soybean are not consumed directly, but are processed into a large number of variety of popular products [2] and have attracted worldwide interest.³ The most popular soybean products are Temphe (fermented soybeans), Tahu or Tofu (soybean curd), Taoge (soybean sprouts), Kecap (soy-sauce), Tauco (fermented mixture) which are usually consumed as side dished with rice [2].

Recently, researchers are interested in the physiologically beneficial phytochemicals from soybeans and soya products. Isoflavones, an important component of soya beans and soya products, has been reported to protect against cardiovascular diseases, breast cancer, prostate cancer, testicular cancer, uterine cancer and other hormone-dependent cancers and osteoporosis [3]. They are an excellent and cheap source of calories and quality protein [4] with 35–40% protein and 18–20% fats and can therefore be useful in combating protein calories malnutrition in the poorer section of the population [4]. Soya milk is the biggest soya based product consumed in the

world, not only because of its potential health benefits but also as an alternative to cow milk targeting for lactose-intolerant individuals, those allergic to milk proteins or those avoiding consumption of milk [5]. It is made from soaked soya beans by grinding, heating and filtering [3]. Soya milk has been found to have close similarities with cow milk [6]. Tofu is the major processed soya bean product in East Asian countries such as China, Japan, and Korea. Tofu curd has traditionally been prepared by adding a coagulant to heated soya milk [7]. Milk is widely used in the preparation of sweetmeats [2]. Importance of milk and milk products has been recognized since vedic times and it is considered to be a complete food [8]. it is also considered as the first food for the newly born offspring. There are numerous studies throughout the world and thousands of references available, especially with regard to milk consumed by humans [9]. About half the milk produced is consumed in the liquid form and the remaining is used to prepare products such as ghee, curd, butter, khoa, paneer, cheese, ice-cream and milk powders. Paneer, a popular indigenous dairy product of India, which is obtained by heat treating the milk followed by acid coagulation using suitable acid, citric acid, lactic acid, tartaric acid, alum or sour whey and it is similar to an un ripened variety of soft cheese which is used in the preparation of a variety of culinary dishes and snacks [8].

Table 1: Comparison of Cow's Milk with Soya Milk

Nutritional Value Per 100 gm	Cow's Milk	Soya Milk
Protein(gm)	3.4	3.6
Fat (gm)	3.5	2.3
Carbohydrate (gm)	4.6	3.4
Kcal	64	49
Lactose	4.6	-
Saturated (%)	63.5	14.0
Poly-unsaturated (%)	3.0	63.5
Mono-unsaturated (%)	33.5	21.6

Source: Zeki (1992).

In India, about 4 percent of the total milk is used for paneer created with milk and sugar preparation [2]. Desserts are known in many cultures of the world as courses that typically come at the end of a meal. They usually consist of sweet, creamy food and consequently high in sugar and fat [11]. Sandesh is a kind of sweetmeat, which is prepared by heating the mixture of freshly, prepared chhana (paneer) and ground sugar on a slow fire [2]. Sandesh is known for its palatability, aroma and as a rich source of milk proteins, fat, sucrose and fat-soluble vitamins [12]. It is popular throughout eastern part of India especially in West Bengal [13]. Milk chhana is usually preferred for sandesh preparation as it produces soft body and smooth texture [14]. The name sandesh is mentioned in medieval Bengali literature, including 'Krittibas' Ramayana and lyrics of Chaitanya. This dish was most likely different from the modern chhana-based sandesh, being made of solidified kheer. Varieties of sandesh are available in the market which may be grossly classified into three main groups such as-first soft grade, second hard grade and third high moisture grade depending upon their physical qualities and chemical composition [15]. This study was taken up, to develop a product with high nutritive value but low cost. Soya protein is an outcome of this strategy. As honey and dates are loaded with nutrients they were replaced for sugar. Where honey is an important source of macro and micronutrients [16] and date fruits have high composition of carbohydrates, salts and minerals, dietary fibre, vitamins, fatty acids and amino acid which gives a unique value in human nutrition [17]. Wide spread acceptability of soya milk by consumers is hindered by the intrinsic beany flavor associated with soybean, therefore the study aimed at innovatively formulating and developing nutrient rich Soya Dates Sandesh, which shows excellent functional characteristics with improved health benefits due to the addition of soya milk, dates and honey to meet the needs of both the young ones as well as to address the needs of health conscious consumers.

2. Materials and Method

The raw materials - cow's milk, soya beans, granulated sugar, dates, honey and rose essence were procured from a local market in Bangalore, Karnataka. Product testing was done at Auriga Research Pvt. Ltd, Bangalore. All chemicals used were of their analytical grade.

2.1 Preparation of Soya Milk

The method used by Kapoor, *et al* (1977) [18] and Akusu O M,

et al (2017) [19] was modified slightly for preparing soya milk. 500g of soybean was soaked in 1500 ml of water for 12 hours to obtain a bean to water ratio of (1:3). The soya bean was blanched in 2L of boiling 0.05% NaHCO₃ in a cooking pot for 15 minutes. The blanched soya bean was hand dehulled physically by means of pressure applied by two hands and the hulls removed by floatation. After removing all husks, blanched soya bean cotyledons were washed in fresh and clean cold water. They were then used for soya milk extraction with 2 gm of cardamom to remove the beany flavor present in soya bean seeds. (Figure 1 and 2)

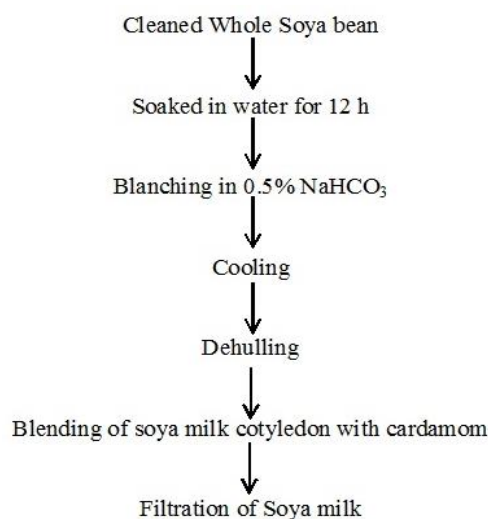


Fig 1: flow Chart for production of soya a milk



Fig 2: Production of soya milk

2.2 Preparation of Paneer and Soya Milk Paneer

Paneer was prepared by boiling both cow milk and soya milk separately into stainless steel pan for about ten minutes and was cooled down slightly and as coagulant citric acid was added at a temperature of 70°C. Lumps of casein were formed as soon as the citric acid was added to the boiled milk, which is generally known as paneer. The content was then allowed to stay for few minutes for complete coagulation of paneer. About 5 to 10 minutes after coagulation, contents were gradually poured into a clean coarse muslin cloth with four corners raised to allow free drainage of whey. When the transfer of whey was completed the four corners of the cloth were tied together for drainage of whey. The coagulum was then carefully removed and weighed. (Figure 3 and 4)

Two different types of sandesh were prepared by different combination of paneer and soya milk paneer as shown in table-2.

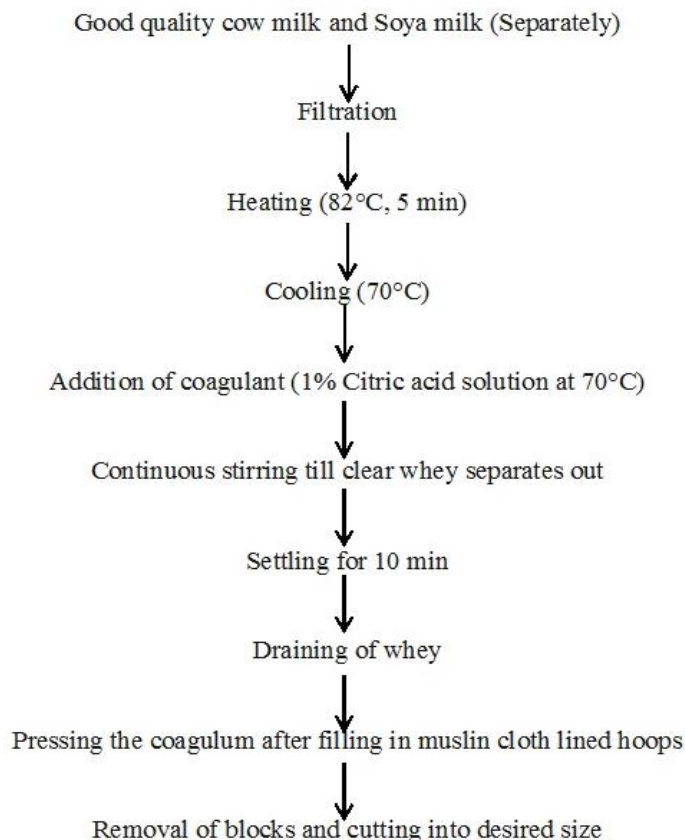
Table 2: Formulation of Soya Dates Sandesh

Sample code	Cow Milk Paneer (gm)	Soya Milk Paneer (gm)	Sugar (gm)	Dates (gm)	Honey (ml)	Rose essence (ml)
C0	300	-	100	-	-	2
V1	225	75 (25%)	-	60 (20%)	20 (7%)	2
V2	150	150 (50%)	-	60 (20%)	20 (7%)	2

Note: *Control Type C0 (Only cow milk paneer)

*Variation Type V1 (Cow milk paneer: Soya milk paneer=3:1)

*Variation Type V2 (Cow milk paneer: Soya milk paneer=1:1)

**Fig 3:** flow Chart for production of cow milk paneer and soya milk paneer (Tofu)**Fig 4:** production of cow Milk paneer and soya milk paneer (Tofu)

2.3 Preparation of Sandesh (Standard)

Figure- 5 shows the preparation of sandesh, where freshly made cow milk paneer was broken into bits. Sugar (35% by weight of total paneer) was mixed into it and was kneaded. Then paneer was taken into an iron pan. The mixture was baked by slow heating with continuous stirring and then scraping with the help of a specially made flat type light

wooden ladle; until pat formation stage appeared then removed from flame. Rose essence was added but no color was used to retain the original color. After sufficient cooling at room temperature, it was then worked into desired size and shape. Sandesh were kept in clean tray and preserved in the refrigerator at 4°C.

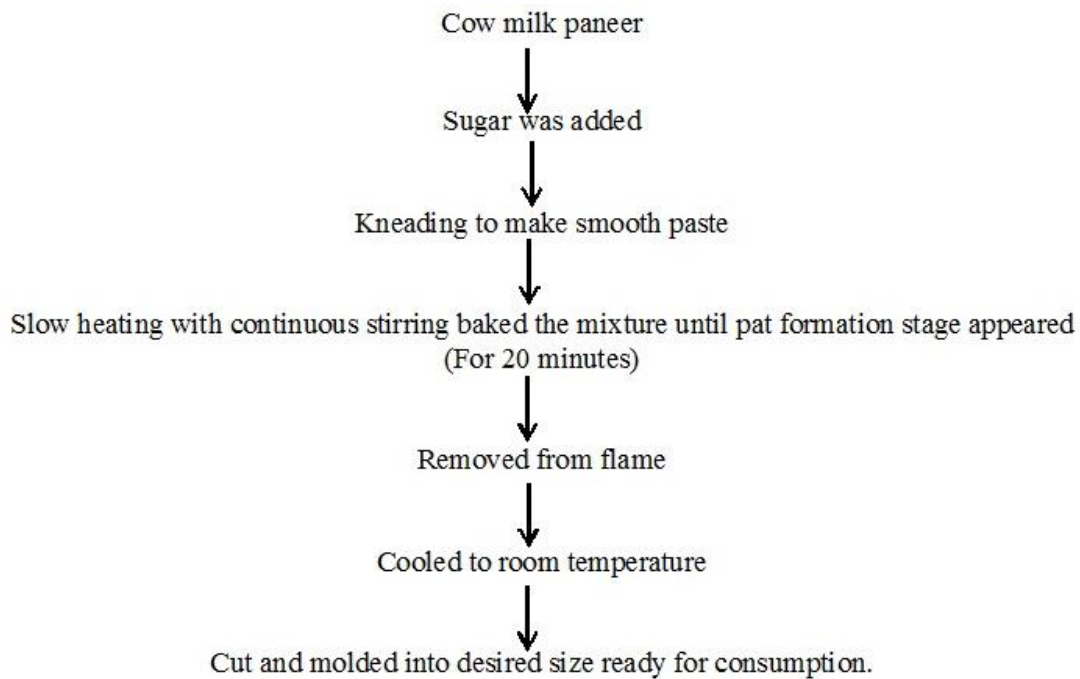


Fig 5: systemic representation of Sandesh preparation

2.4 Preparation of Soya Dates Sandesh

Freshly made soya paneer and cow milk paneer was broken into bits and formulated to different blends as shown in table-2. Mashed dates (20%) and honey (7%) by weight of total mixture was added into it and kneaded. The kneaded mixture was taken into an iron pan. It was baked by heating slowly with continuous stirring and then scraping with the help of a

specially made flat type light wooden ladle; until pat formation stage appeared, then removed from flame. Rose essence was added to remove the beany flavor but no color was added to retain the original color. After sufficient cooling at room temperature, it was then worked into desired size and shape. Soya dates sandesh were kept in clean tray and preserved in the refrigerator at 4°C. (Figure-6)

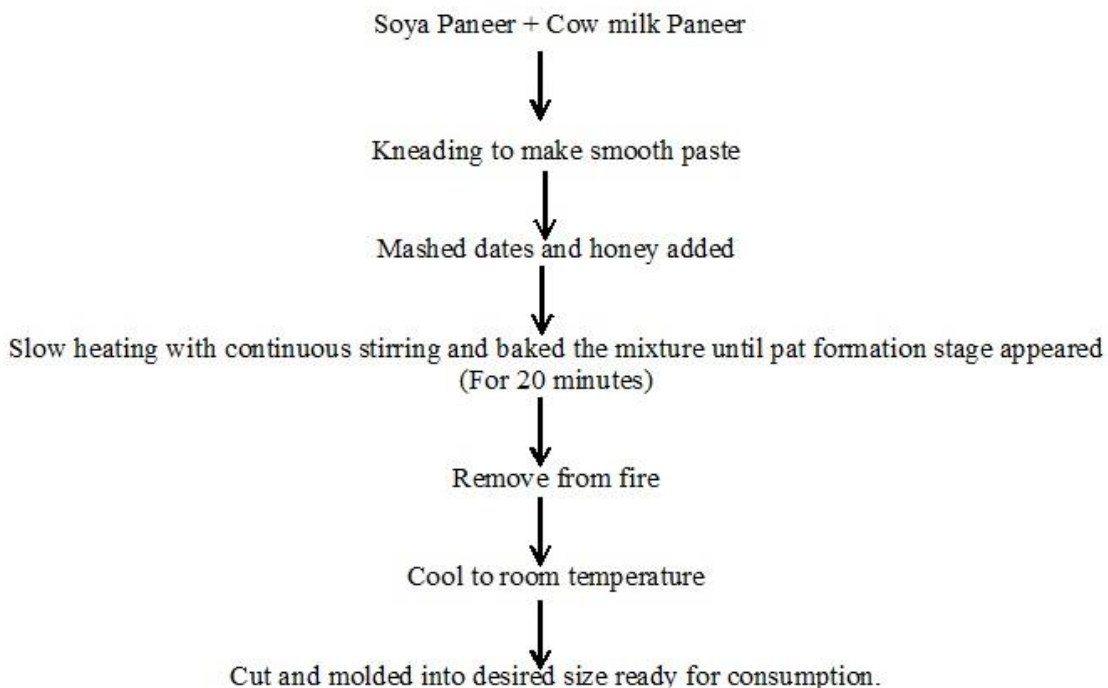


Fig 6: Systemic representation of soya dates sandesh



Fig 7: Soya a Dates sandesh

2.5 Proximate analysis of Soya Dates Sandesh

Moisture, fat, crude protein, carbohydrate, ash and calcium was determined by BIS (Bureau of Indian Standard) methods (2005). While pH was determined according to the method of Pearson (1991) [3].

2.6 Sensory evaluation of Soya Dates Sandesh

The soya dates sandesh produced was evaluated organoleptically for color, taste, aroma, texture and overall acceptability. A panel of ten dietitians from different hospitals was selected as panelists.

A 9 point hedonic scale was used to evaluate the organoleptic parameter of color, taste, aroma, texture and overall acceptability. Each sensory attribute was rated on the 9 point hedonic scale where 1 = dislike extremely, 5 = neither like nor dislike and 9 = like extremely.

2.7 Statistical analysis

The data obtained was subjected to appropriate statistical analysis.

3. Results and Discussion

3.1 Proximity Composition

Sandesh is known for its palatability, aroma and as a rich source of milk proteins, fat, sucrose and fat soluble vitamins [12]. Standard sandesh (C0) was prepared with 100% cow milk paneer and sugar was used as a sweetener. Milk paneer is usually preferred for sandesh preparation as it produces soft body and smooth texture [20] but as soya milk has become a very interesting food due to its extraordinary nutritive value and health characteristics [21] soya dates sandesh of two different variations (V1 and V2) was prepared with different combinations of cow milk and soya milk. Sugar was replaced by dates and honey. Honey is a natural invert sugar and several in vitro and in vivo studies have demonstrated the antimicrobial, antiviral, antifungal, anticancer, antidiabetic activity of honey [22, 23] which may also serve as a natural preservative [12]. Similarly, dates and their constituents show a role in disease prevention through anti-oxidant, anti-inflammatory, anti-bacterial activity [24]. Therefore honey and dates were used as a substitute for sugar. The proximity composition of different blends of sandesh is shown in table-3 with control as (C0). It was observed that there was a significant difference in the protein and moisture content ($p > 0.05$) of V1 and V2 which increased as soya milk paneer was substituted at 25% and 50% to cow milk paneer (C0-12.72%) whereas, the fat content had reduced in V1 and V2

respectively compared to the C0; which was statistically significant ($p < 0.05$).

Table 3: Proximity Compositions of Soya Dates Sandesh

Sample Code	C0	V1	V2
Moisture (%)	47.86	48.93 ^a	49.97 ^a
Protein (%)	12.72	16.63 ^a	17.06 ^a
Fat (%)	14.1	11.71 ^b	8.42 ^a
Ash (%)	0.87	1.05 ^a	0.95 ^a
Carbohydrate (%)	22.5	21.68 ^b	23.6 ^b
Calcium (ppm)	1524.8	1567.9 ^a	1709.1 ^b

Note: C0 (only cow milk paneer), V1 cow milk paneer: Soy-milk paneer =3:1),

V2 (cow milk paneer: Soy-milk paneer =1:1)

a - Statistically significant ($p > 0.05$), b - Non Significant

3.1.1 Moisture

The moisture content of sandesh increased from 47.86% in C0 to 49.9% in V2. The differences in moisture content might be due to the difference in level of fat in these two variations of sandesh on one hand, and also due to the presence of varied proportions of soya milk and paneer solids in paneer.

3.1.2 Protein

It was also observed that increased percentage of soya milk paneer enhanced the protein percentage of soya dates sandesh, ranging from 16.63% in V1 to 17.06% in V2 which can be attributed to the higher ratio of soya milk paneer substitution and also greater content of protein in soya milk paneer than in cow milk paneer which caused the increase in protein. It has been discovered that most leguminous plant seeds are rich in nutrients with good arrays of amino acids and minerals (Fagbemi *et al.* 2004) [25]. Studies have also shown similar increase in protein content in soy-composite flours (Singh *et al.* 2000; Mashayekh *et al.* 2008) [26, 27]. The protein content of cow milk is usually 4.9 gm/100 ml (IFCT 2017) [28] and for soya-milk, it is 3.2gm/100gm.

3.1.3 Fat

As soya milk contains low fat when compared to cow milk and therefore when soya milk paneer was substituted along with cow milk paneer it was observed that the percentage of fat gradually reduced from 14.1% in C0 to 11.71% and 8.42% in V1 and V2 respectively, with lowest percentage of fat present in V2. Enhancing the proportion of soya milk paneer in the mixture affected the fat content of sandesh adversely which may be due to the lower fat content in soya milk as shown in Table-1.

3.1.4 Ash

Ash is an indication of mineral contents of foods and has been discovered to be abundant in soy-supplemented cereal meals (Olugbenga O, *et al.* 2017) [30]. Katra and Bhargava, (1994) reported that soy-milk contains 0.73 percent ash which is similar to average ash content of milk [31]. In the present study, V1 and V2 varied in their ash content when compared to C0. Where V1 had higher percentage of ash (1.05%) compared to C0 (0.85%) and V2 (0.95%). This may be due higher proportion of soya milk paneer in V1 which increased the ash content and also was statistically significant.

3.1.5 Carbohydrates

It was observed that carbohydrate percentage significantly reduced ($p > 0.05$) in V1 compared to C0 which clearly shows that as the percentage of cow milk paneer was reduced, the carbohydrate content also reduced. It was also seen that when equal proportions of cow milk and soya milk paneer was blended the carbohydrate content again increased to 23.6%. Therefore this may be due to considerably higher amount of carbohydrates present in cow milk compared to soya milk.

3.1.6 Calcium

Percentage of calcium gradually increased from C0 to V2. But V1 did not vary significantly ($p < 0.05$) from C0 when compared to V2 which was statistically significant ($p > 0.05$). This may be due to the amount of calcium that is present in soya milk (25mg /100gm) ^[31] which has enhanced the percentage of calcium in V2 along with the cow milk.

3.1.7 Water activity

The importance of knowing the water activity at which the monolayer exists is that it appears to be the most stable water content for food in relation to its shelf-life, because foods prepared and maintained at moisture content just above the monolayer value would presumably be chemically more stable than any other moisture content ^[32]. Therefore in the current study the water activity at 29.24°C was at 0.348. (Table-4)

Table 4: Physicochemical Properties of Soya Dates Sandesh

Sample Code	pH	Water activity Aw at 29.24° C
C0	6.573	0.348
V1	6.020	0.348
V2	5.590	0.348

3.2 Sensory Evaluation

Table-5 shows the mean sensory scores of sandesh. There was a significant difference ($p > 0.05$) in all the sensory attributes between cow milk sandesh (C0) and soya dates sandesh (V1 and V2) except for the texture of V1 which was not significantly different from control ($p < 0.05$). In case of color, taste, aroma and overall acceptability there was a significant difference ($p > 0.05$) between control and variations (V1 and V2). Therefore soya dates sandesh with V1 at 25% of soya milk paneer is better accepted without affecting the sensory attributes of traditional sandesh (figure-5) except for the color which may be due to the incorporation of soya milk paneer.

Table 5: Mean Sensory Characteristics of Soya Dates Sandesh

Sample Codes	C0	V1	V2
Color	8.3	6*	7.1*
Taste	8.05	6.4*	6*
Texture	8.3	8.2 ^{NS}	7.8*
Aroma	8.5	7.5*	6.8*
Overall Acceptability	8.1	6.8*	6.25*

*Statistically significant ($p > 0.05$), NS-Non Significant

4. Conclusion

Thus, from the present study and the results obtained, it can be concluded that nutrient rich soya dates sandesh with high protein content can be obtained with the incorporation of soya milk paneer at different proportions. V1 was more palatable

compared to V2. It was observed that there was a difference in the means scores of taste, color and aroma of V1 and V2 when compared to the control which may be due to the addition of soya milk paneer. But the addition of soya milk paneer did not significantly affect the proximity attributes to a greater extent and V1 was found to be more acceptable. Therefore further studies with the incorporation of soya milk in other traditional products can be taken up to enrich the nutritive value of the products and also to find out a few techniques to enhance the flavor of the product due to the unique beany flavor present in soya milk.

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