Assessment of the Sensory Acceptability of Soy Milk based Sandesh (Traditional Indian Sweet Dairy Dessert) for Elderly People (Aged>60 Years) Living in Kolkata and its Efficacy on the Health Status of Geriatric Population

By Sweata Rani Rai & Sabia Nazmin

Abstract- Background: Aging is often associated with the incidence of degenerative diseases such as cardiovascular, cerebrovascular diseases, diabetes, osteoporosis, and cancer, which affects dietary eating patterns in older adults. With advancing age, there is a decline in appetite and a reduced affinity to food. However, the eighty million citizens of West Bengal including the older adults have a craving for sweets. Therefore, the present study aims to evaluate the sensory and chemical evaluation of Sandesh prepared from soymilk and dates adhering to nutritional needs and dietary preference towards sweets for older adults.

Method: Sandesh is prepared with the substitution of traditional milk chenna (fresh, unripened curd cheese made from cow milk/ buffalo milk) with soy milk and dates syrup.

Keywords: non-dairy sandesh, geriatrics, degenerative diseases, functional food.

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Abstract - Background: Aging is often associated with the incidence of degenerative diseases such as cardiovascular, cerebrovascular diseases, diabetes, osteoporosis, and cancer, which affects dietary eating patterns in older adults. With advancing age, there is a decline in appetite and a reduced affinity to food. However, the eighty million citizens of West Bengal including the older adults have a craving for sweets. Therefore, the present study aims to evaluate the sensory and chemical evaluation of Sandesh prepared from soymilk and dates adhering to nutritional needs and dietary preference towards sweets for older adults.

Method: Sandesh is prepared with the substitution of traditional milk chenna (fresh, unripened curd cheese made from cow milk/ buffalo milk) with soy milk and dates syrup. Sensory evaluation of these two ingredients with graded variations (5gm, 10gm, 15gm, 20gm& 25 gm) of pumpkin seeds and watermelon seeds was carried out by 25 males and 25 females older adults (aged > 60 years) at St Joseph’s Old Age Home, Kolkata. The standard and the most approved product is further analyzed for physical and chemical parameters.

Result & Discussion: As per the product acceptability, the variation with 20g Soymilk chenna+1.25g cardamom powder+1.25ml rose water+10ml dates syrup+5g watermelon seeds+5g pumpkin seeds was the best sample. One serving (50g) of the product provided 5.1g of protein, 12.5g of carbohydrate, 7.3g of fat, 2.6mg of iron, 93.1mg of calcium, 13mg of phosphorus, and the total antioxidant activity (%) was 30%. These nutrients are of more significance in terms of prevention and retardation of degenerative diseases associated with aging in the elderly.

Conclusion: Sandesh fortified with soya milk chenna, dates, pumpkin seeds, and watermelon seeds can prove beneficial for the overall health of the elderly population and also reduce the risk of morbidity.

Keywords: non-dairy sandesh, geriatrics, degenerative diseases, functional food.

I. Introduction

Nutrition acts as an important modifiable determining factor of age-related decline and associated degenerative diseases like obesity, hypertension, and diabetes. Most importantly, dietary adjustments and alterations not only influence present health but can also determine the quality of life in old age. People of West Bengal are traditionally sweet lovers and have always been known for their particular weakness for sweets. Even the older adults are no exception to these sweet cravings.

Sandesh represents the traditional Indian dairy product, which is very common in every household of Eastern India. The traditional method of Sandesh making involves the preparation of chhana (fresh, unripened curd cheese made from cow/ buffalo milk), mixed with sugar (30-35% of chhana), kneaded and cooked at 70-75°C for 10-15 minutes (Fig. 1). The cooked mass was transferred to moulds for desirable shape. The traditional Sandesh, which is prepared by the addition of cow milk chhana and sugar, was replaced by soymilk chhana and dates, respectively, and for further, enrichment pumpkin seed and watermelon seed were added to enhance the nutritional property of the Sandesh.

II. Materials & Methodology

a) Study Design

The sensory evaluation of the product with variations is done by 50- panel members comprising of 25 males and 25 females older adults (aged > 60 years) residing at St Joseph’s Old Age Home, Kolkata. Prior permission is taken from the authorities of the nursing home. The nature, purpose, and objectives of the study is also explained to the inmates and confidentiality was assured. Written informed consent is also taken.

The preparation of the product is carried out in the food and chemistry laboratories of J. D. Birla Institute, Kolkata. All the ingredients are collected from departmental stores in Central Avenue, Kolkata.
b) Product Development

The Sandesh is made with substitution of traditional chenna and sugar with soymilk chenna and dates syrup with varying proportions of graded variations (5gm, 10gm, 15gm, 20gm & 25 gm) of pumpkin seeds and watermelon seeds. The variations are given in (Table 1). The products are then evaluated for sensory and nutritional parameters for production of Sandesh[^3].

![Flow diagram for production of Sandesh](image)

**Table 1: Variations of Sandesh**

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Additional Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product B</td>
<td>20g cow milk chhena+5g powdered sugar+1.25g cardamom powder+5ml rose water</td>
</tr>
<tr>
<td>Product S</td>
<td>20g soymilk chhena+5g powdered sugar+1.25g cardamom powder+5ml rose water</td>
</tr>
<tr>
<td>Product A1</td>
<td>20g soymilk chhena+5ml dates syrup+1.25g cardamom powder+1.25ml rose water</td>
</tr>
<tr>
<td>Product A2</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water</td>
</tr>
<tr>
<td>Product A3</td>
<td>20g soymilk chhena+15ml dates syrup+1.25g cardamom powder+1.25ml rose water</td>
</tr>
<tr>
<td>Product B1</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water+5g watermelon seeds</td>
</tr>
<tr>
<td>Product B2</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water+10g watermelon seeds</td>
</tr>
<tr>
<td>Product B3</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water+15g watermelon seeds</td>
</tr>
<tr>
<td>Product B4</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water+20g watermelon seeds</td>
</tr>
<tr>
<td>Product B5</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water+25g watermelon seeds</td>
</tr>
<tr>
<td>Product C1</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water+10g watermelon seeds+5g pumpkin seeds</td>
</tr>
<tr>
<td>Product C2</td>
<td>20g soymilk chhena+10ml dates syrup+1.25g cardamom powder+1.25ml rose water+10g watermelon seeds+10g pumpkin seeds</td>
</tr>
</tbody>
</table>
Fat (gms) = Weight of extracted fat / weight of the sample

Calculation of Protein:

Estimation of Total carbohydrates

Calculation of Phosphorus:

Calculation of Calcium:

Calculation of Iron:

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**j) Estimation of total antioxidant capacity**

The free radical scavenging activity of the samples was determined using a 2, 2-diphenyl-1, 2-picrylhydrazyl (DPPH) method. An aliquot of 2ml of 0.15mM DPPH in ethanol is added to the test tube with 1ml of the sample extract. The reaction mixture was vortex mixed and left to stand at room temperature in the dark for 20 minutes. The absorbance is then measured at 517nm with the help of a spectrophotometer. The control sample is prepared without adding extract.

\[
\%\text{TAA} = \left[1 - \frac{\text{Absorbance of the sample}}{\text{Absorbance of control}}\right] \times 100 \quad [12]
\]

**k) Statistical Analysis**

The standard deviation and student t-test are done of all the sensory attributes of the standard variation and most approved variation. The mean score is also estimated for the most approved variation with the standard recipe.

**Calculation:**

\[
t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\left(\frac{s_1^2}{n_1}\right) + \left(\frac{s_2^2}{n_2}\right)}}
\]

Where,

- \(\bar{x}_1\) = is the mean of the standard
- \(s_1\) = is the standard deviation of the standard
- \(n_1\) = is the no. of individuals in standard
- \(\bar{x}_2\) = is the mean of the most approved
- \(s_2\) = is the standard deviation of the most approved
- \(n_2\) = is the no. of individuals in most approved

**III. Results and Discussion**

a) **Sensory evaluation of basic and standard**

Acceptability of products is evaluated from the ratings obtained through the scorecard using 9 points hedonic scale during the sensory evaluation. When the mean score of the sensory attributes of the standard (S) is compared with the most approved variation (C2), there was no significant difference observed which can lead to higher acceptability of the product.

**Figure 2:** Comparison of student t-test of sensory attributes of standard (S) and most approved variation (C2)

**Product code**

<table>
<thead>
<tr>
<th></th>
<th>20g Soy milk chenna + 1.25g cardamom powder + 1.25ml rose water + 10ml dates syrup</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>20g Soy milk chenna + 1.25g cardamom powder + 1.25ml rose water + 10ml dates syrup + 5g watermelon seeds + 5g pumpkin seed</td>
</tr>
</tbody>
</table>
b) Macronutrient analysis of standard (S) and most approved product (C2)

From fig 3, it is seen that the protein content of the standard (S) was 8.5 gram, and the most approved product (C2) was 10.2 gram, respectively. Product S is the standard recipe having soybean chenna as the only source of protein. In the most approved product, C2, apart from soybean chenna (43.2gm/100gm), watermelon seeds (34.1gm/100gm), pumpkin seeds (24.3gm/100gm) and dates are added to improve the protein content of the approved product. Soybean protein contains all amino acids essential to human nutrition, which makes soy products almost equivalent to animal sources in protein quality but with less saturated fat and no cholesterol. Furthermore, watermelon seed is high in citrulline, and arginine, and pumpkin seeds are a good source of L-tryptophan, which reduces depression and also aids in sleeping by conversion to serotonin, thereby beneficial for geriatrics. In old age, there is a substantial reduction in physiologic proteins such as organ tissue, blood components, and immune bodies, which contributes to impaired wound healing, loss of skin elasticity, and also inability to fight infection. Therefore, improvising the protein content in the product is beneficial for the elderly.

The total carbohydrate content of product standard (S) and the most approved product was 21.5 gram and 25 grams, respectively. The carbohydrate content of the most approved product was more as the sugar in the standard product is replaced with dates syrup. Dates are ideal fruits to substitute added sugar in foods as the sugar in dates is easily digested and metabolized to release energy for various cellular activities. Dates are also rich in dietary fiber (8.1-12.7%/100gm), phenolic compounds, minerals, vitamins, and antioxidant compounds. The presence of insoluble fibers such as cellulose, hemicellulose, pectin, and lignins in dates further reduces the chances of bowel cancer and regulates bowel movement in older people.
Fig 4 denotes that the iron content of standard (S) and most approved (C2) was 4.3 mg and 5.1 mg per 100 grams, respectively. An increase in the iron content can be due to the addition of dates (1mg/100mg), pumpkin seed (5.5mg/100mg), and watermelon seed (7.4mg/100mg). Iron deficiency anemia is prevalent in old age, particularly after the age of 80. There is also a decline in serum ferritin concentrations observed in the elderly. The iron from soybean ferritin helps to prevent the risk of anemia in old age and prevention of undesirable health outcomes, including increased susceptibility to fall and depression. Dates also contain thiamine, riboflavin, niacin, and pantothenic acid, which help the body in haemoglobin synthesis.

The calcium content of standard (S) and most approved (C2) was 166.6mg and 186.2mg, respectively. The calcium content of the most approved (C2) was more due to the addition of dates, pumpkin seed, and watermelon seed. 100g of dates, pumpkin seed, and watermelon seed contains 22mg, 50mg, and 100mg of calcium, respectively. Calcium helps to ease insomnia and also helps regulate the passage of nutrients through cell walls. Diet deficient in calcium can result in the uptake of calcium from the bones leading to bone resorption. To absorb calcium, nutrients such as magnesium and copper is required, which aids in bone formation. Soymilk contains 12 times the amount of copper and 42 times the amount of manganese as compared to cow milk, which is essential for bone formation. The soy isoflavones, daidzein and genistein, directly hinder bone resorption thereby, reducing the risk of osteoporosis in the elderly population. Furthermore, watermelon seed contains substantial amounts of lysine, which plays a vital role in calcium absorption and the formation of collagen and connective tissue in the body. Moreover, pumpkin seeds contain a considerable amount of zinc, which acts as a natural protector against osteoporosis since zinc deficiencies can lead to higher rates of osteoporosis development.

The result obtained in the study shows the phosphorus content of the standard (S) and most approved variations (C2) as 24mg and 26mg, respectively. The phosphorus content of the most approved was more due to the addition of pumpkin seed and watermelon seed. 100g of pumpkin seed and watermelon seed contains 830mg and 937mg of phosphorus. Soybean contains phosphorus, which help to strengthen teeth and prevent nerve disorder. It was reported that soybean consumption on a regular basis delays the aging process.
d) Total antioxidant analysis by DPPH method

![Figure 5: Comparison of total antioxidant activity of standard (S) and most approved (C2) (DPPH Activity %)](image)

From figure no 5, it is seen that the total antioxidant activity of the standard and most approved one was 45% and 60%, respectively. In old age, inflammation is predominant, which in turn increases the formation of free radical in the body leading to several chronic and life-threatening diseases and health problems including heart disease, cancer, immune dysfunction, diabetes, and degenerative brain disorders (including dementia and Alzheimer’s disease). Antioxidants are known to quench free radicals, thus are essential components of the anti-aging formulation. Consumption of the pumpkin seed and watermelon seed reduces the risk of getting cardiovascular diseases and cancers due to the substantial amount of total phenols and vitamin E present. Dates have the highest concentration of polyphenols (3942 mg/100g) among dried fruits. The antioxidant activity of phenolic compounds is a result of their redox properties, which play an essential role in absorbing and neutralizing free radicals.

IV. Conclusion

Sandesh is a very famous dessert in eastern parts of India and forms part and parcel of social life, ceremonies, and festivals and is enjoyed by all. Soybean protein is considered to be a good dietary protein alternative compared to animal protein in terms of quality of amino acid profile and cost effectiveness. Dates are also considered as an ideal food for the elderly because it provides a wide range of essential nutrients with many potential health benefits. Furthermore, pumpkin seeds and watermelon seeds are a powerhouse of a concentrated sources of iron, zinc, magnesium, B-vitamins, and other phytochemicals. Therefore, the substitution of the traditional cow’s milk chenna with soy milk chenna and fortification with pumpkin seeds and watermelon seeds can prove beneficial for the overall health of the elderly population and also reduce the risk of morbidity and improve quality of life.

REFERENCES RÉFÉRENCES REFERENCIAS


