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Development and Evaluation of Protein-Rich Kova from Soymilk

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Abstract

Soybean milk known for its high protein and nutrient content, it is an alternative to dairy milk in production of kova, a popular Indian dairy based sweet. This study explores the formulation and sensory evaluation of soybean milk based kova as a nutritious and sustainable option for consumers various ratios of soybean milk, sugar, ghee. Soybean milk also known as soy milk, is a plant based beverage made from soybeans. It is a popular alternative to cow's milk and it is suitable for vegans and those who are lactose intolerance. Nutritionally, soymilk is rich in protein, calcium, and vitamins, making it a healthy option, it's low in saturated fats and cholesterol free which contribute to heart health. Additionally soy milk is a good source of phyto nutrients such as isoflavones, which may have various health benefits, including reduce the risk of certain cancers and improving the bone health. It is a good source of omega-3-free fattyacids, a source of antioxidants and high in phyto-estrogens. 3 samples are formulated with the ratio of soymilk : cow milk, (1:3), (1:1), (3:1). The developed and finalized product will be evaluated for physio-chemical, textural, functional, and sensory attributes.

Keywords: Soy Milk, Sugar, Ghee, Cow Milk.

Introduction

Glycine max, commonly known as soy beans a leguminous plant. Soybeans are a good source of high-quality protein, offer numerous nutritional and therapeutic benefits. They are one of the rare plants that supply excellent protein. Soybeans provide a complete set of primary macronutrients essential for maintaining good health, along with fiber, vitamins, and minerals (Fan *et al.*, 1995).

Soy beans are source of soy milk. The process of making soymilk involves soaking Soybeans in water until they soften, followed by grinding them thoroughly. This produces a liquid that has a creamy, milk-like quality, commonly referred to as Soymilk (Pan and Tangratanavalee *et al.*, 2003). Compared to cow milk and human milk, soymilk boasts higher concentrations of protein, iron, unsaturated fatty acids, and niacin, coupled with lower quantities of fat and carbohydrates. For lactose-intolerant individuals, soymilk acts as a significant milk substitute and provides an affordable source of quality protein and energy, particularly in developing countries. Soy milk is a rich source of omega-3 fatty acids—essential “healthy” fats that our bodies cannot produce—and contains significant amounts of Isoflavones, which are potent antioxidants (Saunders *et al.*, 2013). An eight-ounce serving of plain soymilk contains 140 calories, 10 grams of protein, 4 grams of fat, 14 grams of carbohydrates, 120 milligrams of sodium, 1.8 milligrams of iron, 0.1 milligrams of riboflavin, and 80 Milligrams of calcium (Anderson, *et al.*, 2000).

According to studies, cow milk contains more lactose content when compared to soy milk so it can be used as alternative for individuals who are suffering from cow’s milk protein allergy (Golbitz *et al.*, 1995; Kwok and Niranjana, 1995; Nelson *et al.*, 1978). Glycinin and β -conglycinin are the primary proteins in soy, together accounting for over 70% of the total soy protein content (Liu *et al.*, 1997). With its calcium content, soymilk contributes to bone health by prevention of osteoporosis, while its soluble fiber assists in managing blood sugar levels, pregnant and lactating women can benefit from soymilk, which also aids in reducing menopausal symptoms and preventing bone deformities. The calcium, magnesium, and phosphorus found in soy foods help strengthen teeth and prevent nerve disorders. Consistent consumption of soybeans can delay the aging process (Raja *et al.*, 2014).

Kova is the cornerstone of many traditional sweets such as, Kalakand, gulab jamun, peda and barfi. It not only adds richness and depth of flavor to these desserts but also provides a dense, fudgy consistency that is highly prized in confectionery. In addition to its use in sweets, kova can sometimes be found in savory dishes, contributing to their richness. Nutritionally, kova provides good source of energy, being high in fats and proteins, as well as calcium, antioxidants making it more nutritious. The present study was selected to develop Soy kova from soymilk and blend of soymilk and cow milk and to evaluate the sensory and physico-chemical properties of the product.

Materials and Methods

The materials needed for the preparation of kova are soy milk, cow milk, sugar, ghee, citric acid and cardamom powder.



Figure 1: Extraction of soymilk.

Preparation of Soy milk:

Soybean seeds were soaked in water with 3:1 volume to weight ratio for 8 to 10 hours. After the soaking period, the water was drained, and the seeds were rinsed by using fresh water. The soybeans were grinded by adding water as per 1:10 ratio. The mixture was then filtered through a double-layered muslin cloth. The pulp was placed in a muslin cloth and filtered to remove all the liquid. The collected filtrate was then heated at 80°C. After, the soymilk was cooled and kept in the refrigerator for 3 days.

Preparation of kova by using soy milk:

The soy milk was boiled and stirring continued to prevent it from sticking to the bottom of the pan. Once it was boiled, reduce the heat. Stir the mixture continuously to ensure even cooking and to avoid molten. The main aim is to evaporate most of the moisture content, thereby thickening the soy milk. And add sugar and ghee, continue stirring until the soy milk converts into thick, creamy consistency similar to traditional kova. Remove the pan from the heat, once the desired thickness is achieved and let the kova cool. The kova is transferred into an airtight container and store it in therefrigerator.



Figure 2. Preparation of kova.

The kova can be prepared with 3 different composition with soymilk :cow milk i.e, (1:3), (1:1), (3:1). The ingredients are formulated in table 1.

Table 1. Formulation of ingredients.

| Ingredients | Sample 1 | Sample 2 | Sample 3 |
|---------------------|----------|----------|----------|
| Formulation soymilk | 250ml | 500ml | 750ml |
| Cow milk | 750ml | 500ml | 250ml |
| Sugar | 500g | 500g | 500g |
| Ghee | 200g | 200g | 200g |
| Citric acid | 2g | 2g | 2g |
| Cardamom powder | 2g | 2g | 2g |

Results and Discussion

Sensory evaluation

The sensory evaluation helps to characterize the sensory attributes of kova i.e, senses like color, taste, appearance, odor, flavor, texture and overall acceptability (Table 2).

Table 2. Sensory evaluation.

| Sensory attributes | Control | Sample | Sample 2 | Sample 3 |
|-----------------------|---------|--------|----------|----------|
| Color | 8 | 7 | 7 | 8 |
| Taste | 8 | 7 | 7 | 9 |
| Appearance | 7 | 8 | 8 | 8 |
| Odor | 7 | 7 | 7 | 8 |
| Flavor | 7 | 7 | 8 | 9 |
| Texture | 8 | 7 | 7 | 8 |
| Overall acceptability | 8 | 7 | 7 | 8.5 |

Among the three samples, sample 3 was selected for further analysis. The analysis include- Physio-chemical analysis:

Moisture content:

Moisture content in the product can be determined through the application of microwave moisture analyzer.

pH:

To calculate the acidity and alkalinity of the product.

Fat:

The fat content can be determined by using the Soxhlet extraction method.

$$\text{Fat content (\%)} = \frac{\text{Weight of sample}}{\text{Weight of extracted fat}} \times 100$$

Protein:

The protein content can be determined through Kjeldhal method.

Protein content can be calculated by using the following

$$\text{Protein content (\%)} = \frac{(N \times 6.25)}{W} \times 100$$

Carbohydrates:

The carbohydrates content can be determined through Fehling solution.

Table 3. Nutritional composition of protein rich kova.

| Nutrition | Control | Sample |
|------------------|----------------|---------------|
| Moisture | 35% | 40% |
| Ash | 2% | 15% |
| Fat | 4.5% | 5% |
| Protein | 32% | 33% |
| Carbohydrates | 12% | 13% |

Soymilk is a complete protein, providing all essential amino acids. This makes soy-based kova a good protein source, especially for vegans. Soy-based kova typically contains less saturated fat compared to traditional dairy kova. This can be beneficial for heart health. As it's made from soy, soy-based kova is lactose-free, making it suitable for people with lactose intolerance or dairy allergies. Soy contains isoflavones, which are plant compounds that can mimic estrogen in the body. These have been associated with various health benefits, including improved heart health and reduced risk of certain cancer. Soy-based kova can be a good source of essential nutrients like calcium, iron, and B vitamins. Commercially available soy milk is often fortified with additional nutrients, such as vitamin B12 and vitamin D. Soy products often contain dietary fiber, which aids in digestion and helps maintain a healthy gut. Unlike animal-based products, soy-based kova contains no cholesterol, contributing to better heart health.

Conclusion

It was concluded that sample 3 was superior in quality at low price with respect to physical and chemical parameters. The sample 3 with 75% soymilk and 25% cow milk can be utilized for the production of soy based kova with higher consumer acceptability. The product can retain its quality attributes especially the colour and flavor during refrigeration storage. It also provides required nutrients such as proteins, fats, minerals, antioxidants. This study may help soy based products manufacturers in India and other countries to control their overall acceptability.

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