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A study on extracted soymilk and their proximate analysis.

Estudio sobre la leche de soya extraída y su análisis proximal

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ABSTRACT

Soya milk is very healthy and it is a rich source of protein (essential amino acids) and a decent source of potassium. The objectives of this study were to develop soy milk with soaked soybean in water for 12 hrs. The present study methodology is conducted in Food Science and Technology, BBAU was conducted to prepare soymilk. Results from the present research showed significant improvement in cooked soybean milk. In the subsequent evaluation on the quality attributes under the optimum germination condition, soy milk made from 12 hrs.-soaked soybeans presented nutritional value and comparable physicochemical properties to conventional soy milk. The current approach provides a feasible and convenient way for soy-based product innovation in both household and industrial settings. The present study.

Keywords: Soybean, Soymilk, Extraction, Physico-chemical properties.

RESUMEN

La leche de soya es sumamente saludable, además es una rica fuente de proteína (aminoácidos esenciales) y una aceptable fuente de potasio. El objetivo del presente estudio es elaborar leche de soya con granos de soya remojados en agua durante 12 horas. La metodología para preparar la leche de soya se realizó en el departamento “Food Science and Technology (BBAU)”. Los resultados mostraron considerables mejoras en la leche de soya cocida. En la evaluación posterior acerca de los atributos de calidad en condiciones óptimas de germinación, la leche de soya elaborada con granos de soya remojados por 12 horas presentó un valor nutricional y propiedades fisicoquímicas comparables a la leche de soya convencional. El planteamiento actual propone una manera práctica y factible para la innovación de productos hechos a base de soya, tanto en los entornos domésticos como en los industriales.

Palabras clave: granos de soya, leche de soya, extracción, propiedades fisicoquímicas.

INTRODUCTION

Soybean, (Glycine max), also called soja bean or soya bean, annual legume of the pea family (Fabaceae) and its edible seed. The soybean is economically the most important bean in the world, providing vegetable protein for millions of people and ingredients for hundreds of chemical products. Soybean is one of the nature's wonderful nutritional gifts. It is perhaps one of the earliest crops cultivated by man and the most important vegetable source of oil and protein. Soybean provides approximately 60% vegetable protein and 30% oil to the present world (soystats.com). It contains all the three macronutrients (proteins, carbohydrates and fats) in good measure, as well as fibre, vitamins and minerals. Soy protein provides all the essential amino acids and is also the richest dietary source of isoflavones (Patrick and Kalidas, 2004). The soybean is one of the richest and cheapest sources of protein and is a staple in the diets of people and animals in numerous parts of the world. The seed contains 17 percent oil and 63 percent meal, 50 percent of which is protein. Because soybeans contain no starch, they are a good source of protein for diabetics.

Soymilk is the water extract of soybean, which provides high quality proteins and essential amino acids and has zero cholesterol, gluten and lactose (Kwok and Niranjan, 1995). Therefore, soymilk is an excellent dietary protein source for common consumers and more so to vegetarians and people with lactose intolerance. Presently, production of soy-based beverages is one of the major ways in which soybean are utilized. These products fall into a dynamic category in the market registering a good growth in the beverage sector. The major process steps involved in soymilk production are wet grinding and milk extraction. Commercial soymilk production also involves thermal treatment, which assures food safety and extended shelf-life, and inactivates undesirable biologically active compounds such as trypsin inhibitors and lipoxygenase (Liener, 1994). Wet grinding involves both physical and chemical changes while dry grinding is a mere size reduction operation (Kent and Evers, 1994). Wet grinding is generally carried out after complete hydration of the grain that enables the grain to soften (Jagtap et al., 2008). Gowen et al. (2007) reported that during the blanching process seed coat of soybean is plasticized, allowing for faster moisture uptake during the subsequent soaking process. Thus blanching prior to soaking could be beneficial especially at low temperatures (<50°C) by shortening the soaking time required besides decreasing initial microbial count. Water absorption during soaking is directly related to the changes in textural characteristics and grinding properties of soybean. Soymilk and tofu are ethnic products in some Asian countries like China and Japan (Cheng et al., 2005). But they are gaining popularity in other countries due to the increased awareness on the potential benefits of soy food consumption in the prevention of heart disease, postmenopausal syndromes, cancer, aging and osteoporosis.

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MATERIAL AND METHODS

The present study was conducted at Food Science and Technology laboratory Babasaheb Bhimrao Ambedkar University, Lucknow, for the period of 9 months. The present study is an experimental design.

Sampling: The selection of the sample Yellow Soybeans (Glycine max) a small seeded variety was purchased from a local grocery store in Lucknow, Uttar Pradesh. A very small number of seeds with defects were removed from the sample.

Preparation of Soymilk: Soybean seeds were sorting and washing after then soaked in water for 10-12 hrs. The soaked water was decanted and the seeds were washed with fresh water. Hundred grams of soaked soybeans seeds per litre of water was used for grinding. The resulting suspension was filtered through a double layered muslin cloth. The muslin cloth was wrapped around the bean pulp, okara squeezed till all the liquid were extracted. The extracted soymilk was boiled for 15 minutes until the milk boils. That is the method for extraction of soymilk.

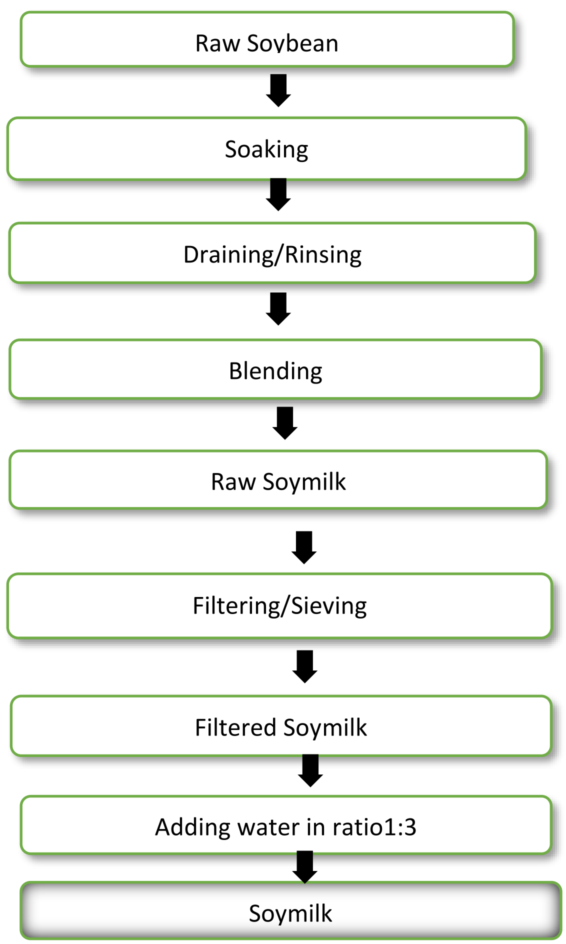

Fig. 1. Flow Chart of techniques used in extraction of Soymilk

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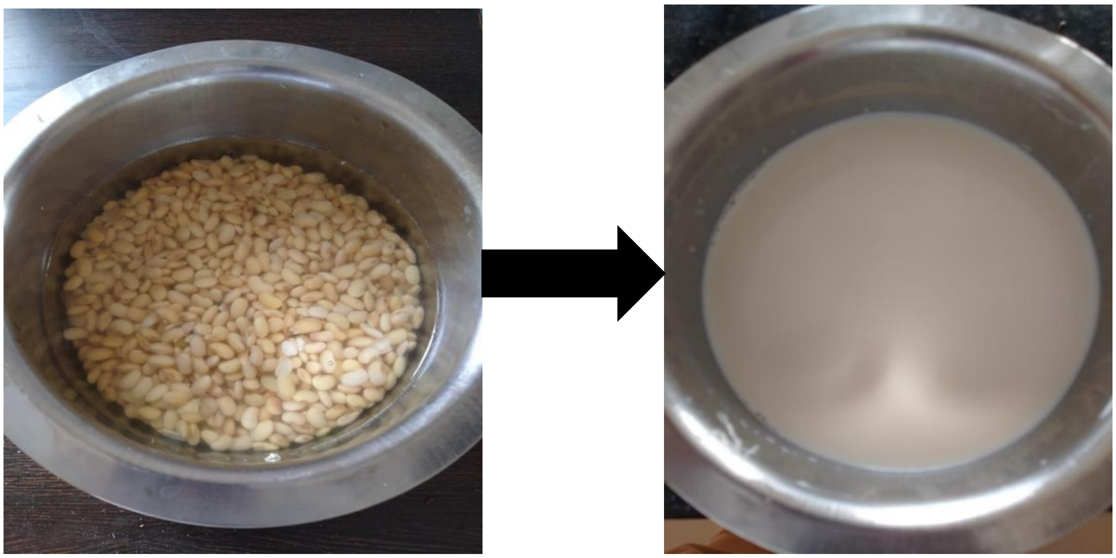

Fig 2. Conversion of soybean into soy milk by the process which is shown in the above flow chart.

Proximate Analysis of Soymilk

1. pH

The 20ml of milk sample was weighed. The milk was poured into boiling distilled water to makeup 100ml of solution. The solution was permitted to cool. Utilizing a digital pH meter, the pH of the solution was estimated. The assurance was done in triplicate and the mean value was considered as the pH of milk.

2. Total solid determination

1. First a flask was taken and weighed.
2. Then 5g of milk samples were taken in the flask.
3. They were then kept in water bath for full dryness.
4. Then it was kept in oven and once it was cooled down, the weight was measured.

Formula -

$$\% \text{ of Total solid } = \frac{\text{weight of flask with sample after drying} - \text{ weight of flask}}{\text{weight of sample}} \times 100$$

3. Protein

2 ml of sample was taken in a Kjeldahl's flask and 1-2g of catalyst mixture was added. The flask was kept in the protein digester. 30 g potassium sulphate and 0.5 g anhydrous cupric sulphate were added to the tube. Further

10 ml of concentrated H2SO4 was added. After Completion of digestion, the tube was cooled at room temperature. Further the tube was placed into automatic digestion unit and 40ml 40% NaOH and 25ml 4% Boric acid was added in receiver by machine. Distillation is done for 9 minutes. Then the receiver flask is removed and 2-3 drops of indicator is mixed following titration with 0.1N HCl/ 1N H2SO4 till end point shows pink color. The titration value is noted down and the protein content is estimated as follows,

$$\text{protein}(\%) = \frac{\text{titration value} \times \text{normality of HcL} \times 6.25 \times 2.089}{\text{sample weight} \times 0.2 \times 1000} \times 100$$

4. Moisture

Approximately 10 g of soy milk was weighed into a pre-weighed crucible and placed in a hot air oven at 100 °C for 15 h. Dried residue was weighed after cooling in a desiccator to calculate total solids, and based on this, moisture content was also determined.

Procedure

- 5 ml of sample was taken.
- Place in a hot plate for 15 min.
- Dried in a hot air oven for 2 to 4 hours.
- Then final reading was taken.

Formula

Final weight- Initial weight / Weight of sample $\times 100$

5. Ash

Ash content was determined after burning in a muffle furnace at 550 °C for 12 h.

Formula-

Ash (%) (dry basis) = $\frac{\text{Mass of sample before drying} - \text{M}}{\text{Mass of sample after drying} - \text{M}} \times 100$

6. Fat

Fat content was measured by weight after alkaline hydrolysis coupled with solvent extraction (ether and petroleum ether).

Formula-

$$\text{Fat (\%)} = \frac{\text{Mass of thimble with extracted fat} - \text{Mass of empty thimble}}{\text{Mass of sample}} \times 100$$

7. Carbohydrate

Carbohydrate content was calculated by subtracting the moisture, protein, fat and ash content from the total mass.

Formula-

% Carbohydrates = 100 – (% protein + % fat + % ash + % fiber + % moisture)

RESULT AND DISCUSSION

The nutritional profile and some physicochemical properties of soybean milk are exhibited in table. The pH of controlled soy milk is within the normal range (~ 6.8) determined, whereas it decreased a little in soybean milk, possibly affected by the changed ash content. The small change is not supposed to be greatly affect soy milk flavour, and salt ion concentration is purposed to have more influence rather than pH; however, the pH change may have some effect on the success of the process using soy milk produced to make other soy products (e.g., tofu and other substitutes), as it is demonstrated to be positively correlated with the coagulation of soy protein. The proximate composition of controlled soy milk contained about 8.4% total solids, 3.4% protein and 1.88% fat. We found that total solids in soy milk might positively relate to carbohydrate content, which essentially correlates well with the results in the present study. This may improve the nutritional value of soy milk produced in terms of carbohydrate combination and eliminate flatulent problems related to soy milk consumption caused by raffinose and stachyose. Meanwhile, the higher moisture content making the soy milk diluted could be a reason contributing to the reduced viscosity. Ash content also significantly reduced, which could result from leaching into the water. Soybean milk is also shown to improve the protein quality, as it promoted and generated a higher protein efficiency ratio and may also benefit the overall protein quality of the soy milk produced. As protein is the most critical nutrient component in soy milk and daily consumption of 25 g of soy protein is recommended to reduce the risk of coronary heart disease, it is advantageous to increase protein concentration in soy milk. However, it is not clear in the present research whether the improved protein value is an effect of increased non-protein nitrogen, The same bean: water ratio was used in all extractions. Processing variables integrated in the experiment included heating, and milling. Despite the variables, the pH and TA for the samples remained consistent for the fresh soymilk (Table 1).

Table 1. Chemical and physical properties of soy milk made from soybean.

Physicochemical properties	Results
pH	6.8±0.02
Total Solids (g/100g soymilk)	84.1±0.03
Moisture (g/100g soymilk)	85.9±0.02
Ash (g/100g soymilk)	0.46±0.02
Protein (g/100g soymilk)	6.24±0.04
Fat (g/100g soymilk)	1.14±0.02
Carbohydrate (g/100g soymilk)	2.66±0.03

CONCLUSION

The purpose of this study was to extract soy milk from soyabean seeds and evaluate the properties of the extracts. In order to identify different and improved potential sources of compatible raw materials that may supplement; augment or enhance current supplies, this purpose of research has been extended. Natural resources provide botanical products high in certain raw resources but are commonly left unused. The plant-based soy milk was analysed for specified physical and chemical properties. The results revealed that chosen products based on plants had more nutritional properties than other food products. The physicochemical properties of soy milk assessed were pH, moisture, protein, total soluble density content, fat, carbohydrate etc. The nutritional profile was checked to evaluate the purity of the milk. To better demonstrate the functional value, additional work is needed to make the soybean milk suitable to be commercialized. For example, although the sensory attributes of the value-added soy milk produced in this project are not supposed to drastically deviate from traditional soy milk, it is necessary to set up a sensory panel to evaluate these attributes and to ensure acceptability by consumers; the stability of formulation is another factor to be considered.

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