



Development of Functional Condensed Milk from Coconut Milk and Soy Milk

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study work was involved with the development of functional condensed milk by mixing soy milk and coconut milk in lieu of cow's milk. Producing condensed milk from both animal milk and plant milk contains a significant difference not only in the chemical composition but also in our health benefit phenomenon. We developed functional condensed milk on five formulations of soy milk and coconut milk. Coconut milk contains 80% moisture, 4% protein, 13.63% fat, 2.37%. Soy milk contains 90.5% moisture, 3.02% protein, 2.24% fat. There are five formulations are A (soy milk: coconut milk=0:1), B (soy milk: coconut milk=1:0), C (soy milk: coconut milk=3:2), D (soy milk: coconut milk=2:3), E (soy milk: coconut milk=1:1). The formulations of five condensed milk were also analyzed for their chemical composition. The statistical analysis showed that formulation B (soy milk: coconut milk=1:0) is more acceptable than other formulations. The statistical analysis showed that, formulation B (soy milk: coconut milk=1:0) is more acceptable than other formulations. Then we did proximate analysis such as moisture content comparison, protein

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content comparison, fat content comparison, ash content comparison and color test (L*a*b* type) (Lightness analysis, Redness analysis and Yellowness analysis) of the five formulations of coconut milk and soy milk in order to observe which formulation would be the best for human purpose our plant produced condensed milk would be an effective alternative of cow's milk condensed milk.

Keywords: Soy milk; coconut milk; condensed milk; ash content; protein content; moisture content; fat content.

1. INTRODUCTION

The term functional food refers a modified food that claims to improve health or well-being by providing benefit beyond that of the traditional nutrients it contains [1]. Condensed milk is not only a staple, but its super versatile in most pantries. Plant milk produced condensed milk would be one of the best substitutes of animal milk produced condensed milk.

A stable emulsion of oil, water and protein which is extracted from whole soybeans is termed as soymilk. It is an off-white emulsion containing the water soluble proteins and carbohydrates and most of the oil of the soybeans. Soy foods have become increasingly popular since the Food and Drug Administration (FDA) approved the soy protein health claim in 1999 [2]. More effectiveness of soy milk than cow's milk is free of cholesterol, gluten and lactose plus favorable photochemical compounds linked to health. The most significant role of soymilk is lactose free which is beneficiary for lactose intolerance people. Soybean is a good source of phenolic compounds with antioxidant properties and has an extraordinarily high amount of iso flavones, a group of photo estrogens that have been reported to possibly lower the risk of hormonal and age-related diseases. So, undoubtedly soy milk is better for us [3].

Extracting milk from the flesh of coconut, coconut milk is high in saturated fat, it is much healthier than other saturated fat products, and the fat is easily metabolized by the body [4]. It contains anti-carcinogenic, anti-microbial, anti-bacterial, anti-viral and antifungal properties. The main saturated fat that it contains, lauric acid is also found in mother's milk and has been shown to promote brain development and bone health as well as boosts our immune system [5].

Condensed milk is basically a form of milk produced by evaporating the moisture from milk. It is concentrated milk to which sugar has been

added to act as a preservative. Here we developed functional condensed milk from soy milk and coconut milk. The term "functional" as it applies to food has adopted a different signification-that of providing an additional physiological benefit beyond that of meeting basic nutritional needs [6]. The Institute of Medicine's Food and Nutrition Board defined functional foods as "any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains [7].

2. MATERIALS AND METHODS

2.1 Study Area and Period

The study was carried out in department of Food Technology and Rural Industries, Bangladesh agricultural University, Mymensingh, Bangladesh. This study was conducted for a period of about 3 months starting from 25 January 2018 to 1st March.

2.2 Materials

Sugar, Sodium bi carbonate, Vanilla Essence, Whey Protein powder, soy bean (soy milk), coconut (coconut milk).

2.3 Instruments

Water Bath, Beaker, Saucepan, Knife, Sieve, Weight machine.

2.4 Sample Preparation

- (1) Soy Milk Extraction
- (2) Coconut Milk Extraction
- (3) Mixing of soy milk & coconut milk

2.5 Soy Milk Extraction

At first figuring the soy bean, it was soaked into a beaker with .5% Sodium bi Carbonate at 80°C for 1 hour in water bath. The ratio of water and

soy bean to be soaked was 2:1 [8]. After 1 hour the beaker as removed from the water bath. After that water was removed and dehulling soy bean was done by using hand. After dehulling the soy bean, it was balanced for 10 min with addition of 0.5% Sodium bi Carbonate at the temperature of 60°C. The ratio of water and soy bean to be soaked was 2:1. Then the seed was grinded with 100°C hot water. And the ratio was 4:1. Then soy milk was extracted with the help of cheesecloth. Then soy milk was pasteurized at 65°C for 30 min [9].

2.6 Coconut Milk Extraction

At first we took raw coconuts (without fibrous husk) and separated coconut meat from raw coconut by grating coconut meat. After that we added water (coconut: water=1:2). Then blending the mixture. After blending we filtered the mixture and achieved coconut milk [10].

2.7 Preparation of Functional Condensed Milk

At first taking coconut milk & soy milk heating at 65°C. Then using homogenizer we homogenized the mixture. Next, we added sugar (%of total amount of milk) and added 3.5% whey protein Powder of the mixture [11]. After that we evaporated the mixture in accordance with added 0.5% baking Soda. Mixture concentration reduced 3 times than original milk. At the same time we added 2-3 drops of Vanilla Essence and cooled at room temperature and packaging [12].

Table1. Amount of coconut milk & soy milk in 5 formulations

Formulation	% of soy milk	% of coconut milk
A	0	100
B	100	0
C	60	40
D	40	60
E	50	50

The Table 1 represents the amount of soy milk and coconut milk quantity (as per 100%) formulation by indicating A, B, C, D, E. We prepared condensed milk using of these formulations & then performed chemical analysis and color measurement of these [13].

2.8 Proximate Composition Analysis

Ash content comparison:

$$\% \text{ of Ash Content} = \frac{\text{Weight of Ash} \times 100}{\text{Initial weight of sample}}$$

Fat content comparison:

$$\% \text{ of Crude Fat} = \frac{\text{Weight of fat-soluble material}}{\text{weight of sample}}$$

2.9 Color Parameter (L* a* b* test)

Color measurement instruments such as chromometer, Hunter, Gardener, or Macbeth, Colorimeters and Spectrometers can detect differences indiscernible to the human eye and then instantly display these differences in numerical terms. After identifying color differences using L* a* b*, it should be decided whether the sample is acceptable or not.

We used chromometer to L* a* b* test. It is a handheld, portable measurement instrument designed to evaluate the color of the objects, particularly with smoother surface conditions or minimal color variation [14]. It accurately identifies color characteristics in objects, determines color differences between objects and provides pass/fail assessments to immediately determine if the sample meets the defined standard.

The L dimension defines the lightness, the dimension refers to the red-green hues, and the b dimension refers to the blue-yellow hues [15]. A sample with a positive a value and a positive b value will be in the yellow-red quadrant [16]. A sample with a positive a value and a negative b value will be in the red-blue quadrant values attached to this dimension s will indicate the chrome or intensity of color.

3. RESULTS AND DISCUSSION

3.1 Moisture Content

The moisture content of five different formulation of functional condensed milk was determined in Fig. 1 [17].

In Fig. 1, statistical analysis we observe that C formulation has less moisture content than others [18]. The condensed milk which contains less moisture content is acceptable. So; we conclude that formulation C is more acceptable [19].

3.2 Ash Content

The ash content of five different formulation of functional condensed milk was determined. The fat content was given in Fig. 2 [20].

In Fig. 2, statistical analysis we observe that C formulation has more ash content than others. The condensed milk which contains more ash content is acceptable. So; we conclude that formulation C is more acceptable.

3.3 Fat Content

The fat content of five different formulation of functional condensed milk was

determined [21]. The fat content was given in Fig. 3.

In Fig. 3, statistical analysis we observe that B formulation has less fat content than others. The condensed milk which contain less fat content is acceptable. So, we conclude that formulation B is more acceptable.

3.4 Protein Content

The protein content of five different formulation of functional condensed milk was determining [22]. The fat content was given in Fig. 4.

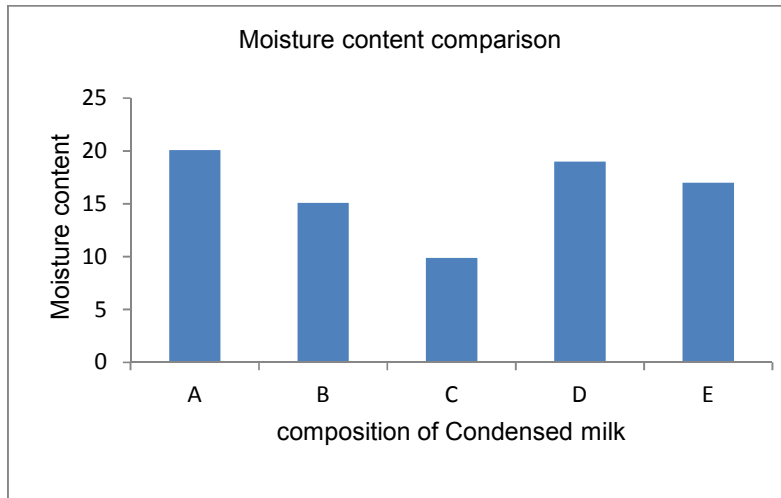


Fig. 1. Moisture content comparison of five formulations of condensed milk

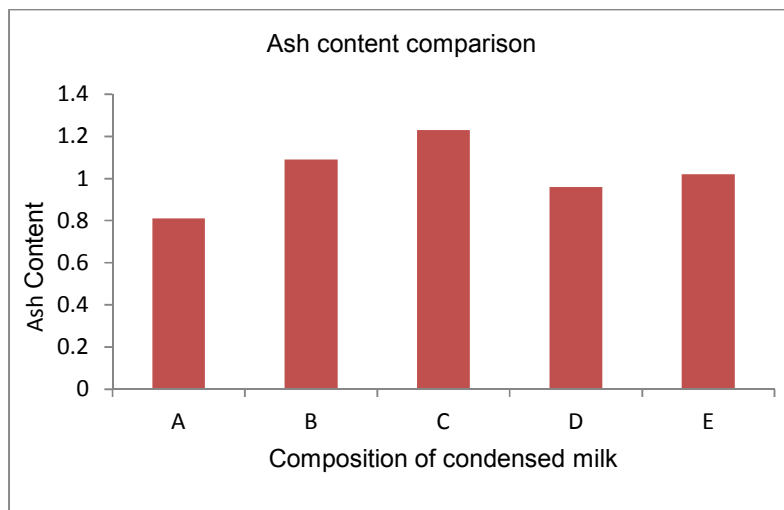


Fig. 2. Ash content comparison of five formulations of condensed milk

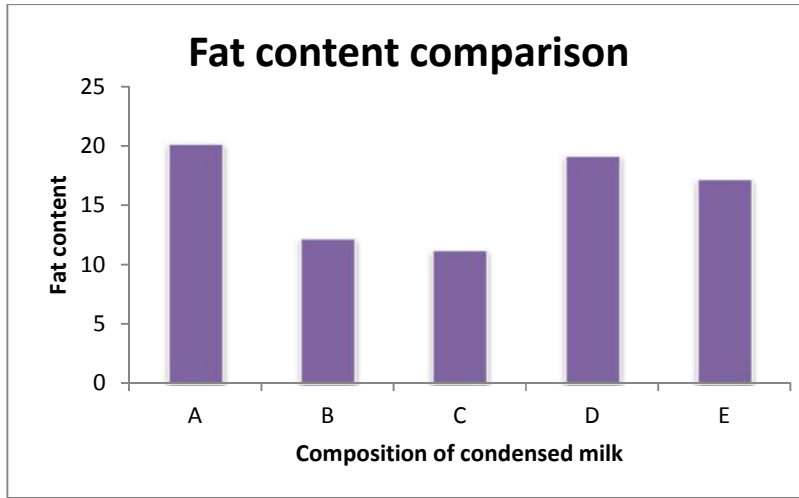


Fig. 3. Fat content comparison of five formulations of condensed milk

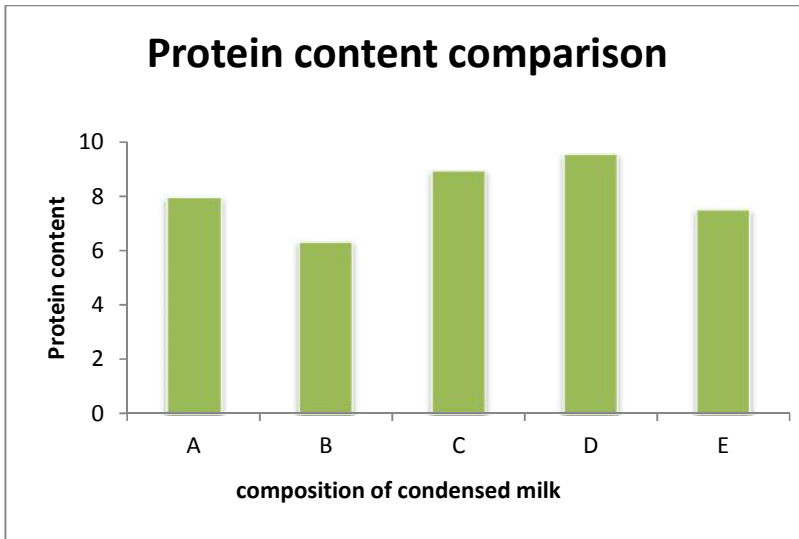


Fig. 4. Comparison of protein content five formulations of condensed milk

In Fig. 4, statistical analysis we observe that D formulation has more protein content than others. The condensed milk which contains more protein content is acceptable. So; we conclude that formulation d is more acceptable. But the difference between C and D sample of protein content is very low. So, formulation C & D are about same.

3.5 Color Parameter (L *a* b* type)

While traditional condensed milk from cow's milk dominates the market, research shows U.S non dairy milk sales are growing in lieu of cow's milk. It's hard to argue with the spectrum of nutrients

in milk, unless we have lactose intolerance or milk protein allergy. In this case, plant based condensed milk would be one of the best substitute. Coconut milk contains 80% moisture, 4% protein, 13.63% fat, 2.37%. Soy milk contains 90.5% moisture, 3.02% protein, 2.24% fat. There are five formulations are A (soy milk: coconut milk=0:1), B (soy milk: coconut milk=1:0), C (soy milk: coconut milk=3:2), D (soy milk: coconut milk=2:3), E (soy milk: coconut milk=1:1).The formulations of five condensed milk were also analyzed for their chemical composition. The statistical analysis showed that formulation C (soy milk: coconut milk=1:0) is more health effective than other formulations.

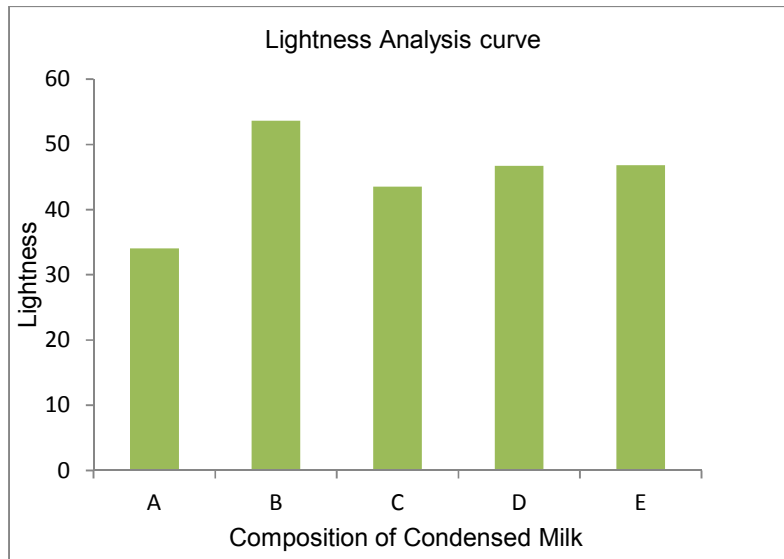


Fig. 5. Lightness analysis of condensed milk

4. CONCLUSION

After development of functional condensed milk we analyzed the proximate analysis of the condensed milk. Also we compare the fat content, protein content and moisture content. We also analyzed $L^* a^* b^*$ test. On the purpose of nutritional analysis, we summarize that formulation C is more acceptable than other samples. Because the formulation C has less moisture content and fat content than others. Moreover formulation C has also contain more protein content than others. So, we conclude that formulation C is more acceptable than others. On the purpose of $L^*a^*b^*$ analysis, we summarize that formulation B is more acceptable than other formulations.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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