Journal of Food and Nutrition Sciences
2016; 4(1): 11-17
Published online February 24, 2016 (http://www.sciencepublishinggroup.com/j/jfns)
doi: 10.11648/j.jfns.20160401.13
ISSN: 2330-7285 (Print); ISSN: 2330-7293 (Online)

Preparation of Soymilk Using Different Methods

M. F. Afroz[1], Wasima Anjum[2], Md. NurulIslam[2], Md. Ahsanul Kobir[1], Kaiyum Hossain[3], Abu Sayed[4, *]

[1]Department of Biotechnology, Bangladesh Livestock Research Institute, Savar, Dhaka, Bangladesh
[2]Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh
[3]Biman Poultry Complex, Gonakbari, Savar, Dhaka, Bangladesh
[4]Department of Agricultural Engineering, EXIM Bank Agricultural University Bangladesh, Chapainawabgonj, Bangladesh

Email address:
abu_982@yahoo.com (A. Sayed)

To cite this article:
M. F. Afroz, Wasima Anjum, Md. Nurul Islam, Md. Ahsanul Kobir, Kaiyum Hossain, Abu Sayed. Preparation of Soymilk Using Different Methods. *Journal of Food and Nutrition Sciences.* Vol. 4, No. 1, 2016, pp. 11-17. doi: 10.11648/j.jfns.20160401.13

Abstract: The present experiment was conducted to prepare soymilk from whole soya seed by using various techniques. Twelve (12) soymilk samples were prepared by three different methods with four concentration level. Each sample was analyzed for proximate composition and sensory qualities were evaluated by a taste panel. No significant difference was found between dehulled soy seed blending milk and whole soy seed powder milk. But 125g concentration obtained highest score from the judges. From the results of chemical analysis, significant difference was found in terms of moisture, total solids, solids- not- fat, protein, fat, carbohydrate, ash content and acidity percentage. Dehulled soy seed blending milk contained more moisture, protein, fat and ash content. On the other hand, a sharp increase of nutrient concentration was observed with the increase of soymilk concentration. But soymilk of 150 and 175g concentration become thicker after boiling which had fewer acceptances by the judges. Considering the physical and chemical properties of all samples, it is recommended that 125g concentrate dehulled soy seed blending milk may be prepared in industrial scale.

Keywords: Soya Seed, Soymilk, Organoleptic Score and Sensory Quality

1. Introduction

Milk is the nature's most nearly perfect food for the newly born infant or animal and for all ages of people. But, there is an acute shortage of milk and other protein rich food of animal origin in Bangladesh. Consequently the incidence of protein malnutrition is very high among pre-school children, expectant and nursing mothers. For this purpose, low cost processed supplementary protein rich food need to be developed in Bangladesh [1]. Soybean has been recognized as one of the premier agricultural crops today for various reasons in the world [2]. Now-a-day different types of human foods are prepared from soybean such as soymilk, tofu, Ice cream, beverage etc [3]. Oil and protein rich soybean has now recognized all over the world as a potential supplementary source of edible oil and nutrition [4]. Soymilk is a rich creamy milk of whole soybeans. The nutrients content in eight ounces of plain soymilk are 140gm calories, 10gm protein, 4gm fat, 14gm carbohydrate, 120g sodium, 1.8mg iron, 0.1mg riboflavin and 80mg calcium [5]. Soymilk is free of milk sugar lactose and for this reason there is no chance of occurring lactose intolerance syndrome. Also, it is good alternative for those who are allergic to cow's milk. It naturally has about the same amount of protein (but not the same proteins) as cow milk.

Soybean can play a vital role in balancing the protein deficiency of our diet. Protein content of soybean is about 2 times of other pulses, 4 times of wheat, 6 times of rice grain, 4 times of egg; 12 times of milk. Soybean has 3% lecithin, which is helpful for brain development. It is also rich in Ca, Protein and Vitamins A, B, C and D [2]. In countries or regions where animal protein are not available or where the price of meat are beyond the purchasing power of average population, soybean and soybean products may be used as their substitutes. Unfortunately no published/unpublished information is available on the preparation of soymilk under Bangladesh condition. This indicates that systematic research work in this line is urgently needed to develop technique for making soymilk. For this reason the present research work was conducted to prepare soymilk using different methods and to recommend

a suitable method for soymilk preparation and to evaluate the physical and chemical qualities of soymilk.

2. Materials and Methods

2.1. Collection of Soybean Seed

The study was conducted at the Dairy Technology and Microbiology Laboratory of the Department of Dairy Science, Bangladesh Agricultural University, Mymensingh during the period of lst February to 30th May, 2012. High quality wholesome and mature soybean seeds were purchased from local markets of Trishal Upazilla of Mymensingh District. After sun drying the seeds were kept in airtight plastic containers for experimental purpose.

2.2. Methods of Preparation

Soymilk was prepared in the Laboratory using following 3 (three) methods: I. Preparation of soymilk from dehulled soybean by blending method, II. Preparation of soymilk from whole soybean powder and III. Preparation of soymilk from dehulled sundry soybean powder. In each methods four concentration of soy seeds were used. The concentrations were 100, 125, 150 and 175g soybean in different forms/1000ml of milk. Three trials were given during the experimental period. The results obtained for various parameters studied from different types of soymilk with different concentration during the experiment are presented in this section.

2.2.1. Preparation of Soymilk from Dehulled Soybean by Blending Method

The clean fresh 550 gm soybean seeds were taken and they were divided into four parts, having 100, 125, 150 and 175g in each part respectively. They were soaked separately in water for 10-12 hours or overnight. Small amount of sodium bicarbonate (0.3%) were added with water. The main purpose of using sodium bicarbonate was to remove the bitterness and anti-nutritional factors (trypsin inhibitor). Soaked soybean's husk were removed by means of pressure of two hands and cleaned with continuous flow of fresh water. Then clean dehulled soybeans were ground with 1000 ml of water separately by blending machine for 10-15 min at low speed to prepare 100, 125, 150, and 175g concentrate soymilk. The homogenized mass was strained through a fine cloth to separate milk from residue. Soymilk was then boiled at 100°C for 10-15 minutes with constant stirring.

2.2.2. Preparation of Soymilk from Whole Soybean Powder

1000 gm whole soybean free from immature field damage and black spot were grinded in a soy flour mill l00g, l25g, 150g and 175g powder was dissolved with 1000 ml of water respectively by stirring. The milk was strained through a fine cloth to separate the residue. Soymilk was then boiled at 100°C for 10-15 minutes with constant stirring.

2.2.3. Preparation of Soymilk from Dehulled Sundry Soybean Powder

Dry whole soybean were cleaned, washed and soaked in tap water overnight in 4 times of weight (w/v) with 0.3% sodium bicarbonate. After decanting the soak water, the beans were washed again with fresh tap water. Soaked soybean's husk were removed by means of pressure of two hands and cleaned with continues flow of fresh tap water. After wash the soybean seed was sun dried to its original moisture content. The sundried dehulled soybean was grinded in a soy flour mill l00g, l25g, 150g and 175g powder was dissolved with 1000 ml of water respectively by stirring. The milk was strained through a fine cloth to separate the residue. Soymilk was then boiled at 100°C for 10-15 minutes with constant stirring.

2.3. Chemical and Physical Analysis

Physical tests (Smell, color & appearance, texture and sediment taste) were performed organoleptically with the help of an expert panel of judge by using a score card. Chemical tests (Moisture content, total solids content and solids- not- fat content) were done in the Dairy Technology Laboratory, Department of Dairy Science. Moisture content, total solids content, Protein, acidity percentage, ash content and fat percentage were determined by the method suggested as per method described by [6]. On the other hand, carbohydrate content and solids- not- fat content were determined by the calculating method.

2.4. Statistical Analysis

Main effect in this experiment was three methods and within each method there were four concentration levels. For this reason data was analyzed by using 3 x 4 factorial experiments. Analysis of variance tests were performed to find out the statistical difference within treatments and each case of significant difference LSD test was carried out to compare the mean values of different treatment.

3. Results and Discussion

3.1. Smell and Taste

The average smell and taste score of dehulled soy seed blending milk (A), Whole soy seed powder milk (B) and sundry dehulled soy seed powder milk (C) type soymilk were 38.59±0.77, 41.0±0.3 and 33.99±0.62 respectively (Table 1). From the statistical analysis it was found that the smell and taste score of A, B and C type soymilk samples differ significantly ($p<0.01$). From the table it was found that B type soymilk has highest smell and taste score and lowest in case of C. The result indicates that method of soymilk preparation affect the smell and taste score.

Table 1. *Average value of chemical composition of different types of soymilk.*

Sources of variation	Types of soymilk			LSD/SED value	Level of significance
	A	B	C		
Smell and taste	38.59^{b}±0.77	41.0^{a}±0.30	33.99^{c}±0.62	1.59	**
Color and Appearance (20)	15.84^{a}±0.87	15.17^{a}±0.32	12.08^{b}±0.42	1.56	**
Texture (20)	15.91^{a}±0.62	16.17^{a}±0.64	12.92^{b}±0.49	1.59	**
Sediment (10)	7.99^{a}±0.23	6.75^{b}±0.52	5.4^{c}±0.42	1.07	**
Overall score (100)	78.33^{a}±2.48	79.17^{a}±1.75	64.25^{b}±1.94	5.49	**

Means with different superscript in the same row differ significantly ($p<0.05$), ** = 1% level of significance, where, A= Dehulled soy seed blending milk, B= Whole soy seed power milk and C= Sundry dehulled soy seed power milk.

Table 2. *Average value of chemical composition of different concentration of soymilk.*

Sources of variation	Concentration of soymilk				LSD/SED value	L.S
	1	2	3	4		
Smell and taste	38.77^{a}±1.79	38.55^{a}±2.32	37.65^{ab}±1.85	36.44^{b}±2.31	3.46	**
Color and Appearance (20)	15.00^{a}±1.07	15.33^{a}±1.58	14.00^{b}±1.02	13.11^{c}±1.09	2.03	**
Texture (20)	15.67^{a}±0.84	16.11^{a}±1.39	14.67^{b}±1.0	13.55^{c}±0.95	1.77	**
Sediment (10)	7.4^{a}±0.58	7.1^{a}±0.78	6.7^{b}±0.78	5.7^{c}±0.88	1.27	**
Overall score (100)	77.0^{a}±4.17	77.11^{a}±5.89	72.78^{b}±4.6	68.78^{c}±4.80	8.15	**

Means with different superscript in the same row differ significantly ($p<0.05$), ** = 1% level of significance, where,1= 100g/1000ml of water, 2= 125g/1000ml of water, 3= 150g/1000ml of water and 4= 175g/1000ml of water.

On the other hand smell and taste score of 100, 125, 150 and 175g concentration soymilk (i.e. 1, 2, 3 and 4) were 38.77±1.79, 38.55±2.32, 37.65±1.85 and 36.44±2.31 (Table 2) respectively. Statistical analysis showed that there was significant difference within the smell and taste score of different concentration. Highest score was found for 100g and lowest score for l75g concentration soymilk. The result indicates smell and taste score decreased with increased concentration of soybean because beany flavor increased. The interaction effects of method and concentration level were non-significant. Smell and Taste score of A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, C3 and C4 were 39.67±0.88, 40±0.58, 38.0±0.58, 36.67±l.45, 41.33±O.33, 4l.33±0.33, 4l.67±0.67. 40.67±0.33, 40.33±0.33, 35.33±0.33, 34.0±0.58, 34.33±0.88 and 32.33±0.88 respectively (Table 3).The result of interaction effects indicates that highest smell and taste score was obtained in B2 combination(i.e. Whole soy seed powder milk and 125g concentration) and lowest score was obtained in C4 combination (Sundry dehulled soy seed powder milk and 175g concentration).

Table 3. *Average score of various organoleptic characteristics of different types of soymilk different concentration.*

Sources of variation	Types of soymilk							
	A1	A2	A3	A4	B1	B2	B3	B4
Smell and taste (50)	39.67±0.88	40.00±0.58	38.00±0.58	36.67±1.45	41.33±0.33	41.67±0.67	40.67±0.33	40.33±0.33
Color and Appearance (20)	16.67±0.33	17.67±0.33	15.33±0.88	13.67±0.67	15.33±0.33	16.00±0.58	14.67±0.33	14.67±0.33
Texture (20)	16.33±0.33	17.33±0.33	15.67±0.67	14.33±0.33	16.67±0.33	17.67±0.33	15.67±0.33	14.67±0.33
Sediment (10)	8.30±0.33	8.30±0.33	8.00±0.33	7.30±0.00	7.60±0.33	7.30±0.33	6.70±0.33	5.30±0.33
Overall score (100)	81.0±0.57	83.33±0.33	77.00±1.00	72.00±1.53	81.33±0.33	82.67±0.67	77.67±0.67	75.00±0.58

Table 3. *Continued.*

Sources of variation	Types of soymilk				SED value	Level of significance
	C1	C2	C3	C4		
Smell and taste (50)	35.33±0.33	34.00±0.58	34.33±0.88	32.33±0.88	0.29	NS
Color and Appearance (20)	13.00±0.00	12.33±0.33	12.00±0.58	11.00±0.58	0.35	NS
Texture (20)	14.00±0.00	13.33±0.33	12.67±0.33	11.60±0.33	0.15	NS
Sediment (10)	6.3±0.33	5.70±0.33	5.30±0.33	4.30±0.33	0.13	NS
Overall score (100)	68.67±0.67	65.33±1.33	63.67±0.67	59.33±1.33	0.36	NS

Means with different superscript in the same row differ significantly ($p<0.01$), * = 5% level of significance and ** = 1% level of significance, where, A= Dehulled soy seed blending milk, B= Whole soy seed power milk and C= Sundry dehulled soy seed power milk and 1= 100g/1000ml of water, 2= 125g/1000ml of water, 3= 150g/1000ml of water and 4= 175g/1000ml of water.

From the analyses of the results of different combinations of method and concentration it was found that different method and concentration had significant effect on smell and taste score but interaction effects had no significant effect on smells and taste score. From the results it is clear that judges prefer B method and for this reason score was highest, second highest score was for A method of soymilk. Escuetaand Banzon [7] stated that addition of 1% chocolate

powder increased further acceptability of the soymilks. Unfortunately nopublished information has come in attention to author in relation to method and concentration level. For this reason, it was not possible to compare the data obtained from this study with other workers.

3.2. Texture

The average texture score of soymilk prepared by different methods and concentration are shown in (Table 1). It was found that the average texture score of A, B and C type soymilk were l5.91±0.62, l6.17±0.64; l2.92±0.49, respectively. Lowest score was seen in C type milk. But there was no-significant difference between A and B type soymilk. The result indicates that method of soymilk preparation affect the texture score. Texture score of 100, 125, l50 and 175g concentration soymilk (i.e. l, 2, 3 and 4) were l5.67±0.84, l6.11±l.39, l4.67±l.0 and l3.55±0.95 respectively. Highest score was secured by 125g concentration soymilk and lowest score was obtained by l75gconcentration soymilk.

The result of interaction effects (Table 3)indicates that highest texture score was obtained in B2 combination(i.e. whole soy seed powder milk and 125g concentration) and lowest score was obtained in C4 combination (Sundry dehulled soy seed powder milk and l75gconcentration).From the analyses of the results of different combinations of method and concentration it was found that different method and concentration had significant effect on texture score but interaction effects had no significant effect on texture score.

3.3. Sediment

The average sediment score of A, B and C type soymilk were7.99±0.23, 6.75±0.52, 5.4±0.42 respectively (Table 1). Highest score was recorded in A type milk and lowest score was seen in C type milk. But there was no significant difference between B and C type soymilk. Average sediment score of 100, 125, l50 and l75g concentration soymilk (i.e. 1, 2, 3 and 4) were 7.4±0.58, 7.1±0.78, 6.7±0.78 and 5.7±0.88 respectively (Table 2). Highest score was secured by l00g concentration soymilk and lowest score was obtained by 175g concentration soymilk.

The result of interaction effects indicates that highest sediment score was obtained in B1 and B2 combination (i.e. Dehulled soy seed blending milk with l00g and 125g concentration) and lowest score was obtained in combination C4 (Sundry dehulled soy seed powder milk and 175gconcentration).From the results it is clear that judges prefer A method and for this reason score was highest, second highest score was for B method of soymilk.

3.4. Overall Score

Overall score of different types of soymilk such as A, B and C were78.33±2.48, 79.17±1.75 and 64.25±l.94 respectively (Table 1).Statistical analysis showed that was no significant difference between A and B type soymilk. Overall score of 100, 125, 150 and 175g concentration soymilk (i.e. 1, 2, 3 and 4) were77.0±4.17, 77.11±5.89, 72.78±4.56 and 68.78±4.80 respectively (Table 2). Highest score was secured by 125g concentration soymilk and lowest score was obtained by 175g concentration soymilk. No significant difference was found between100 and 125g concentration soymilk. The interaction effects of method and concentration level on overall score was non-significant ($p<0.01$). It was found that overall score were 81.0±0.57, 83.33±0.33,77.0±1.00, 72.0±1.53, 81.33±0.33, 82.67±0.67, 77.67±0.67, 75.0±0.58, 68.67±0.67,65.33±1.33, 63.67±0.67 and 59.33±1.33 for A1, A2, A3, A4, Bl, B2, B3, B4, Cl, C2, C3and C4 respectively (Table 4, 3).Highest score is obtained in A2 combination.

3.5. Chemical Analysis

3.5.1. Moisture Content

The moisture contents of A, B and C type soymilk were903.86±10.72, 892.23±12.22 and907.32±1054 (g/kg) respectively (Table 4). From the results, it is evident that there was significant difference within the moisture content of different type of soymilk. Highest moisture content was in C type milk. But no significant difference was found between A and C type soy milk. On the other hand moisture content of 100, 125, 150 and 175g concentration soymilk (i.e. 1, 2, 3 and 4) were 927.05±3.34, 909.82±4.16, 892.45±4.95 and 875.20±5.81 (g/kg) respectively (Table 5). Average moisture content of different types of soymilk with different concentration is shown in Table 6.The effect of concentration level on moisture content of soymilk was significant. Plernchai [8] found 91.4% moisture in soymilk.

Table 4. *Average value of chemical composition of different types of soymilk.*

Sources of variation	Types of soymilk			LSD/SED value	Level of significance
	A	B	C		
Moisture (g/kg	903.86^{a}±10.72	892.23^{b}±12.22	907.32^{a}±10.54	29.67	**
Total solids (g/kg)	96.15^{b}±10.72	107.75^{a}±12.20	92.75^{b}±10.51	29.64	**
S.N.F. (g/kg)	61.37^{b}±7.26	77.33^{a}±9.08	63.23^{b}±7.32	21.13	**
Protein (g/kg)	38.75^{a}±4.5	37.81^{a}±4.44	34.83^{b}±1.08	11.57	**
Fat (g/kg)	29.83^{a}±2.33	26.25^{b}±3.07	25.75^{b}±2.99	8.42	**
Carbohydrate (g/kg)	20.97^{c}±2.54	38.14^{a}±4.47	26.99^{b}±3.21	9.26	**
Ash (g/kg)	6.54^{a}±0.21	5.55^{b}±0.22	5.10^{c}±0.25	0.42	**
Acidity (%)	0.17^{a}±0.02	0.15^{b}±0.02	0.13^{c}±0.02	0.065	**
pH	6.6±0.08	6.7±0.0	6.6±0.04	0.04	NS

Means with different superscript in the same row differ significantly ($p<0.05$), ** = 1% level of significance, NS= Non significant, where, A, B, C = same the meaning which are previously stated.

Table 5. *Average value of chemical composition of different concentration of soymilk.*

Sources of variation	Concentration of soymilk				LSD/SED value	Level of significance
	1	2	3	4		
Moisture (g/kg	927.05a±3.34	909.82b±4.16	892.45c±4.95	875.20d±5.81	7.76	**
Total solids (g/kg)	72.95d±3.34	90.18c±4.26	107.54b±4.94	124.73a±5.80	7.75	**
S.N.F. (g/kg)	49.00d±3.68	61.09c±4.57	73.35b±5.52	85.81a±6.37	8.56	**
Protein (g/kg)	27.00d±0.85	33.75c±1.07	40.51b±1.28	47.26a±1.50	2.00	**
Fat (g/kg)	19.78d±0.94	25.00c±1.17	29.78b±1.45	34.56a1.57	2.18	**
Carbohydrate (g/kg)	20.94d±3.66	25.86c±4.65	31.31b±5.49	36.70a±6.31	8.53	**
Ash (g/kg)	5.24d±0.44	5.50c±0.46	5.90b±0.39	6.24a±0.41	0.71	**
Acidity (%)	0.10d±0.02	0.133c±0.00	0.17b±0.12	0.20a±0.02	0.07	**
pH	6.60±0.03	6.60±0.03	6.70±0.05	6.50±0.09	0.12	NS

Means with different superscript in the same row differ significantly ($p<0.05$), ** = 1% level of significance, NS= Non significant, where, A, B, C = same the meaning which are previously stated.

3.5.2. Total Solids Content

Table 4 showed that mean total solids content of A, B and C type soymilk were96.15±10.72, 107.75±12.20 and 92.75±10.51 (g/kg) respectively. From this table it was observed that total solids contents of B type soymilk were highest. Total solids contents were decreased in A and C type soymilk. It might be due to the variation in moisture content of soymilk prepared by different method. On the other hand total solids content of 100, 125, 150 and 175gconcentration soymilk (i.e. 1, 2, 3 and 4) were72.95±3.34, 90.18±4.26, 107.54±4.94 and 124.73±5.80 (g/kg) respectively (Table 5). The effect of concentration level on total solids of soymilk was significant. Average total solids of different types of soymilk with different concentration are shown in Table 6. [9] Stated that soymilk contain 12.25% of total solids.

3.5.3. Solids-Not-Fat Content

The average solids-not-fat content of soymilk prepared by different methods and concentration were shown in Table 4 to 5. The average solid not fat content of A, B and C type soymilk were 61.37±7.26, 77.33±9.08 and 63.23±7.42 (g/kg) respectively. Solids not fat content in A, B and C type soymilk differ significantly. From the table it is observed that solids not fat content was highest in B type soymilk followed by C and A type. So it can be concluded that the solids not fat content of soymilk was influenced by method of preparation. On the other hand solid-not-fat content of 100, 125, 150 and 175g concentration soymilk (i.e. 1, 2, 3 and 4) were 49.00±3.68, 61.09±4.57, 73.35±5.52 and 85.81±6.37 (g/kg) respectively. The effect of concentration level on solids not fat content of soymilk was significant.

Table 6. *Average value of chemical composition of different types of soy milk with different concentration.*

Sources of variation	Types of soymilk							
	A1	A2	A3	A4	B1	B2	B3	B4
Moisture (g/kg)	928.77±1.45	912.17±1.83	895.53±2.13	878.93±2.50	920.60±2.41	901.73±3.03	882.77±3.61	863.80±4.26
T. Solids (g/kg)	71.23±1.45	87.83±1.83	104.46±2.13	121.07±2.50	79.40±2.41	98.27±3.03	117.23±3.61	136.10±4.16
S.N.F. (g/kg)	44.67±0.20	55.60±1.41	66.83±1.92	78.40±2.19	56.33±2.03	70.16±2.61	84.33±3.18	98.5±3.15
Protein (g/kg)	28.17±0.72	35.23±0.90	42.27±1.10	49.33±1.24	27.50±0.28	36.37±0.38	41.27±0.43	48.13±0.49
Fat (g/kg)	21.66±0.88	27.33±1.20	32.67±1.45	37.67±1.45	19.0±0.57	24.0±0.57	28.67±0.88	33.33±0.88
Carb. (g/kg)	15.33±0.48	18.70±0.32	22.83±0.80	27.03±0.98	27.83±1.68	34.57±2.19	41.60±2.61	48.57±2.89
Ash (g/kg)	6.07±0.03	6.37±0.03	6.70±0.00	7.03±0.03	5.05±0.07	5.33±0.09	5.7±0.15	6.06±0.06
Acidity (%)	0.12±0.00	0.15±0.00	0.19±0.00	0.24±0.01	0.11±0.01	0.13±0.01	0.16±0.00	0.005±0.00
pH	6.6±0.0	6.6±0.0	6.8±0.0	6.4±0.0	6.7±0.0	6.7±0.0	6.7±0.0	6.7±0.0

Table 6. *Continued.*

Sources of variation	Types of soymilk				SED value	L.S
	C1	C2	C3	C4		
Moisture (g/kg)	931.77±1.45	915.57±1.85	899.07±2.13	882.87±2.50	1.05	NS
T. Solids (g/kg)	68.23±1.45	84.43±1.85	100.93±2.13	117.07±4.16	1.04	NS
S.N.F. (g/kg)	46.00±1.15	57.50±1.25	68.90±1.90	80.53±2.25	0.89	NS
Protein (g/kg)	25.33±0.88	31.67±1.12	38.00±1.32	44.33±1.56	0.39	NS
Fat (g/kg)	18.66±0.33	23.67±0.33	28.0±0.57	32.67±0.33	0.36	NS
Carb. (g/kg)	19.67±0.84	24.30±1.12	29.50±1.67	34.50±1.70	0.66	NS
Ash (g/kg)	4.57±0.07	4.80±0.10	5.4±0.07	5.63±0.06	0.03	NS
Acidity (%)	0.08±0.00	0.12±0.00	0.15±0.01	0.16±0.01	00	NS
pH	6.7±0.0	6.6±0.0	6.6±0.0	6.5±0.0	-	NS

Means with different superscript in the same row differ significantly ($p<0.05$), * = 5% level of significance and ** = 1% level of significance.

3.5.4. Protein Content

The average proteins content of A, B and C type soymilk were 38.75±4.5, 37.81±4.44 and 34.83±4.08 (g/kg) respectively (Table 4). There was significant difference among the protein content of different types of soymilk samples. Highest score was obtained in A type soymilk. Protein content of 100, l25, 150 and l75g concentration soymilk (i.e. l, 2, 3 and 4) were 27.00±0.85, 33.75±l.07, 40.5l±l.28 and 47.26±l.50 (g/kg) respectively (Table 5). The effect of concentration level on protein content of soymilk was also significant. Average protein content of different types of soymilk with different concentration are shown in Table 6.Protein content of soy milk was studied by different researchers. Shikder [9] found that protein content of soymilk was 3.08%.Plernchai [8] found 2.8% protein in soymilk.

3.5.5. Fat Content

The average fats content of A, B and C type soymilk were 29.83±2.33, 26.25±3.07 and25.75±2.99 (g/kg) respectively (Table 4 &5). There was significant difference among the fat content of different type of soymilk samples. From this result it was observed that A type soymilk had highest fat content. On the other hand fat content of l00, 125, l50 and l75g concentration soymilk (i.e. l, 2, 3 and 4) were l9.78±0.94, 25.00±1.17, 2978±1.45 and 34.56±1.57 (g/kg) respectively. The effect of concentration level on fat content of soymilk was also significant. The interaction effects of method and concentration level were non-significant. Average fat content of different types of soymilk with different concentration are shown in Table 6. Fat content of soymilk was studied by several researchers. The fat content of the present experiment agree with the findings of [9].

3.5.6. Carbohydrate Content

The average carbohydrates content of A, B and C type soymilk were 20.97±2.54, 38.14±4.47 and 26.99±3.21 (g/kg) respectively (Table 4). There was significant difference ($p<0.05$) among the carbohydrate content of different type of soymilk samples. Carbohydrate content of B type soymilk was significantly higher than A and C type soymilk. This might be due to hull content of B type soymilk. On the other hand carbohydrate content of 100, 125, 150 and l75g concentration soymilk (i.e. 1, 2, 3 and 4) were 20.94±3.66, 25.86±4.65, 31.31±5.49 and 36.7±6.31 (g/kg) respectively (Table 5). The effect of concentration level on carbohydrate content of soymilk was also significant. Average Carbohydrates of different types of soymilk with different concentration are shown in Table 6.

3.5.7. Ash Content

The average ash content of A, B and C type was 6.54±0.2l, 5.55±0.22 and 5.10±0.25 (g/kg) respectively (Table 4). There were significant differences ($p<0.01$) among the ash content of A, B and C type soymilk. Ash content was significantly increased in A type soymilk. A type milk was most preferable. Ash content of 100, 125, 150 and l75g concentration soymilk (i.e. 1, 2, 3 and 4) was 5.24±0.44, 5.5±0.46, 5.9±0.39 and 6.24±0.41 (g/kg) respectively (Table 5). The effect of concentration level on ash content of soymilk was also significant.

3.5.8. Acidity Percentage

The percentage of acidity of A, B and C type soymilk were 0.17±0.020, 0.15±0.02 and 0.13±0.02 respectively (Table 4). There was significant difference among A, B and C type soymilk. Acidity percentages of l00, 125, l50 and l75gconcentration soymilk were 0.10±0.02, 0.133±0.00, 0.17±0.12 and 0.20±0.02 respectively (Table 5). Significant difference was in concentration level.

3.5.9. pH Value of Different Soymilk Samples

The pH value of A, B and C type soymilk were 6.6±0.08, 6.7±0.0 and 6.6±0.04respectively (Table 4). There was no significant difference among A, B and C type soymilk. PH value of l00, 125, l50 and l75g concentration soymilk (i.e. 1, 2, 3 and 4) were 6.6±0.03, 6.6±0.03, 6.7±0.05 and 6.5±0.09 (Table 5). No significant difference was found within concentration. The interaction effects of method and concentration level were non-significant. Average pH values of different types of soymilk with different concentration are shown in Table 6.

4. Conclusions

From the statistical analysis significant difference was found in dehulled soy seed blending milk (A), whole soy seed powder milk (B) and sundry dehulled soy seed powder milk (C) type soymilk but no significant difference was found between A and Btype soymilk sample. So, we can accept either A type or B type milk. On the basis of 100, 125, l50 and l75g concentration soymilk, the highest score was found for125g concentration soymilk. And highest score was obtained in dehulled soy seed blending milk of 125 concentrations sample (A2).Chemical analysis showed that total solids, solids not fat content, protein, fat, carbohydrate, ash, pH and acidity value increased with increased concentration of soybean and the moisture content decreased with increased concentration of soybean. From the results of chemical parameters significant difference was observed within A,B and C in terms of moisture content, total solids content, solids not fat content, protein content, fat content, carbohydrate content and acidity percentage. Statistical analysis showed that moisture, protein, fat, and ash content are significantly higher in A type soymilk. B type milk contains more carbohydrate because this type of milk was prepared from soy seed containing hull. On the other hands, it is evident that nutrient contents increase with the increase of concentration of soymilk. But after boiling it is found that l50 and l75g concentrate soymilk become thicker which had less acceptability by the judges. Judging from the results of all parameters dehulled soy seed blending milk with l25gconcentration may be recommended for consumption.

Saeed *et al*. [10] stated that dehulled soybean milk is more nutritious as compared to whole soybean milk.

Acknowledgment

This paper is the result of a project work sponsored by Department of Dairy Science, Bangladesh Agricultural University, Mymensingh.

References

[1] Rakhi TA, Islam MN, Hoque SAM, Rahman MM. Development of mango flavored Soy Dahi. *Bangladesh Journal of Animal Science*. 42, 2013, p. 44-48.

[2] Rahman L. Cultivation of soybean and its uses. The city press. Dhaka. 1982, p.5-7.

[3] Li J, Hsieh YHP. Traditional Chinese food technology and cuisine. *Asia Pacific Journal of Clinical Nutrition*. 13, 2004, p. 147-155.

[4] Kaul AK, Das ML. Oil seed in Bangladesh, Ministry of Agriculture, Dhaka, 1986.

[5] Anderson JJB, Adlercreutz H, Barnes S, Bennink MR, *et al.* Appropriate is flavones food fortification levels: Results of consensus conference, Univ. of No. Carolin Helsinki, Ala, Birmingham, Michigan St., Minnesota, Iowa St., Cincinnati, Purdue and Illiors; San Diego CA April, 2000, p. 15-18.

[6] AOAC, Association of Official Agricultural Chemists. Official Methods of Analysis. 10th Edition. Washington, DC, USA, 2003.

[7] Escueta EE, Banzon JA, Comparative acceptability of soymilk produced by different processing methods. Philippine. *Journal of Science*, 108 (1&2), 1979, p. 55-63.

[8] Plernchai. Application of Soybean and Soybean Products in Thailand. Nutrition and Health Department, Institute of Food Research and Product Development, Kasetsart University, 2000.

[9] Shikder FH. Evaluation of nutritive value and shelf life of soymilk. Department of food Technology and Rural Industries, Bangladesh Agricultural University, Mymensingh, 2003.

[10] Saeed SN, Almas K, Bhatty N, Hashmi AS, Biological evaluation of whole soymilk produced by indigenous soybean. *Pakistan Journal of Scientific and Industrial Research*, 44 (6), 2001, p. 356-360.

[11] Kim JH, Lee HJ, Characteristics of cheese manufactured by co-precipitation of whey and soya milk. Soybean abstract. 9 (11), 1985, p. 306.