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Preparation and analysis of physicochemical and organoleptic properties of soy based beverages

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ABSTRACT

The soy proteins being cheaper are considered to have a great potential as an effective substitute of milk proteins. The TSS content of soymilk was 5°brix, total solids was 10.2% and acidity was 0.1%. Soymilk- whey blend was prepared by incorporating four different levels of sugar. The total soluble solids are higher in 60% mango blended soy beverages and minimum in control. The maximum acidity was found in case of 60% pineapple blended soy beverages while minimum acidity was observed in control samples. In this study it was found that the 50% mango soy beverage was best accepted among other soy based beverages after 20 days storage. In order to find the presence of bacterial load, standard pour plate method in nutrient agar was carried out. There was acceptable amount of microbes observed at the end of the storage period. Since, information is lacking in respect of systematic work on the development of soymilk beverages along with milk whey and incorporation of fruit pulp.

Keywords: Soymilk, Milk, physicochemical, microbiological, beverages

1. INTRODUCTION

The milk proteins are quite costly and are not within the reach of most of the Indian population because of financial constraint. Therefore, the soy proteins being cheaper are considered to have a great potential as an effective substitute of milk proteins. In recent years, soybean protein which ranks highest among vegetable proteins has been in use in many protein food products especially in protein rich beverages [1]. Soybean is the world's richest natural source of protein with a number of amino acids essential for health [2]. It contains useful human nutrients but those nutrients will not be available to people unless palatable foods are made from soybeans, the use of soybean as a human food is limited especially in India due to its beany flavour [3]. There has been lot of research on the potential health benefits of soybeans particularly with respect to cancer prevention, cardiovascular disease, and osteoporosis and in lowering cholesterol [4]. Soybean is known for its anti-nutrients like trypsin inhibitors, hem agglutinins and phytic acid [5]. One of the most promising soy foods is soymilk. Soymilk is extracted from soybeans using modern technology and can be made to taste great while maintaining all the nutritional value of soybean. Although it does not taste like dairy milk, it has its own characteristics taste. Soymilk can be handled and used much in the same way as dairy milk. It can be used in hot and cold beverages like coffee, tea, fruit shakes, yoghurt and ice cream [6].

Fruits could be used in masking the beany flavour thus promoting acceptability of soymilk. This could be beneficial to communities where cow's milk is unacceptable, unavailable or unaffordable or due to lactose intolerance. Lemon grass was the best among the tested flavouring materials in masking the beany flavour, improving the taste and general acceptability. Honey was next to lemon grass and was more effective than sugar in masking this flavour [7]. Blending with common fruits like bananas and pineapples and other low cost ingredients as flavouring agents such as lemon grass, honey or sugar to suppress the unpleasant flavour in soybean- based products. The soymilk based beverages was developed by blending soymilk with pineapple, banana, honey or sugar on acceptability of the resulting blends. Pineapple-flavoured blends were more acceptable than the banana flavoured ones. Banana-flavoured blends resulted in phase separation that accounted for the relatively low acceptance. Common fruit like pineapple could be used in promoting acceptability of soymilk. Increased use of these beany flavor suppressants results in development of soymilk based beverages [8]. Mango is a fruit which belong to the genus Mangifera, consisting of numerous species of tropical fruiting trees in the flowering family Anacardiaceous. Mango is generally sweet, although the taste and texture of the flesh varies across cultivars, some having a soft, pulpy texture similar to an overripe plum. Mango is rich in a variety of phytochemicals and nutrients. The fruit pulp is high in prebiotic dietary fiber, vitamin C, diverse polyphenols and provitamin A carotenoids. Mango peel contains pigments that may have antioxidant properties [9]. Colour is an important index of quality in juices and beverages. Mango has excellent stable color. Hence, it can provide desirable colour to the blended beverages apart from above benefits. Since, information is lacking in respect of systematic work on the development of soymilk beverages along with milk whey and incorporation of fruit pulp. Therefore, the present study was conducted to prepare soymilk beverage and determine its physicochemical, organoleptic and microbial characteristics.

2. MATERIAL AND METHODS

Raw materials include soybeans, double tonned milk, mango and pineapple were purchased from local market.

Preparation of soymilk

The soybean was cleaned, soaked in water (soybean: water, 1:6) for 8-12 hours and husk was separated from the bean by pressing the bean followed by washing with water. The slurry was mixed with water in ratio 1:10 (bean: water), heated to 110^{o}C for 10 minutes and finally drained from the grinder and filtered through a muslin cloth. The process of soymilk preparation is presented in Fig. 1.

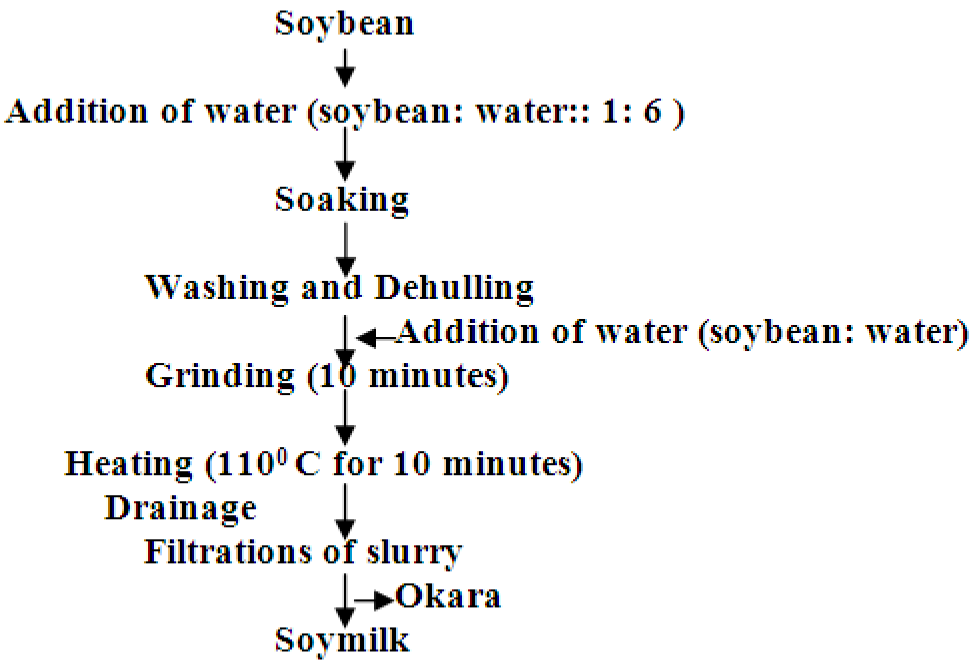

Fig 1 Flow chart for soymilk production

Preparation of milk whey

The whey was obtained using double toned milk by simple acid coagulation methods. The hot milk in stainless steel vessel was acidified using citric acid (2g/kg milk). The milk was heated to 82^{o}C. Milk protein was coagulated with citric acid and filtering whey through muslin cloth.

Preparation of beverage from soymilk

The milk whey was combined in ratio of 1:1 with soymilk. The mango juice and pineapple juice of different concentration were then added into the soymilk and Whey and mixed well**.** The sugar and citric acid was added in different concentrations. The content was heated to 80^{o}C and filled in the sterilized glass bottles. A control was also prepared by using soymilk, whey without addition of juice.

Preparation of blends

Table 1 show the ratios of soymilk, milk whey and fruits juices taken for the preparation of soy beverages. Each sample of beverage was prepared from the different ratios of fruit juice concentration which is mentioned. Each sample of soy milk and milk whey was formulated with all of the mentioned ratios of fruit juices and on basis of sensory evaluation, best combination of fruit juices along with the combinations of soy milk and milk whey were selected to prepare soy based beverage.

Table 1 Concentration of soymilk, milk whey and fruit juices

Sample	Soymilk: Whey (ml)	Mango Juice (ml)	Pineapple Juice (ml)
1	60:60	80	-
2	60:60	-	80
3	50:50	100	-
4	50:50	-	100
5	40:40	120	-
6	40:40	-	120

Physicochemical analysis of soy beverages
Moisture

Moisture content was determined as per AOAC [10] method in case of soybeans. Weighed amount (5 g) of sample was in a clean, dried and weighed aluminium dish. The contents were dried in an oven at 130^{o}C for 2 hours till a constant weight was obtained and cooled in desiccators. After cooling, the loss in weight was taken as moisture content and expressed in terms of percentage.

Total solids

Total solids were determined in soymilk, dairy milk and beverages according to AOAC [10]. 10 grams of sample was placed in a weighed dish in an oven at 100^{o}C for 3 hours and weighed till constant weight was obtained.

Total soluble solids [TSS (^{O}Brix)]

Total soluble solids content of pulp and beverages was determined by using a hand refract meter (Erma, Japan) with solid scale in the range of o to 32^{o}Brix. The values were expressed as ^{o}Brix. 2 g of pulp was crushed for juice extraction. Juices of macerated pulp were squeezed by hand through muslin cloth. The juice was immediately used for determination of TSS by using hand refract meter.

Titra table acidity

Titratable acidity was determined according to AOAC [10]. 10 ml sample was titrated against 0.1N NaOH using phenolphthalein as indicator. It was expressed as percent lactic acid in case of milk, per cent citric acid in fruit pulp.

pH

The pH of the sample was determined using the digital pH meter (Electronics India). First standardized the pH meter against a buffer of known pH i.e. pH 4 and pH 9. Now, first wash the glass electrode and reference electrode with distilled water and then with the acid solution. Take 5 ml of HCl solution in a 400 ml beaker. Add sufficient water so that the glass electrode as well as the reference electrode is completely dipped. Note the pH of pure acid solution. Now add 1 ml of 0.1N NaOH (prepared exactly 0.1 N by dilution method) from the burette in the beaker. Stir the contents well. Note the pH of the solution. Now go on adding NaOH solution, up to say 9 – 10 ml of NaOH. Near the equivalence point, the alkali should be added in fractions (0.2 ml).

Determination of Protein

The protein estimation is done by Lowry method given by Lowry et al. [11]. Different dilutions of BSA solutions are prepared by mixing stock BSA solution (1 mg/ ml) and water in the test tube as given in the table. The final volume in each of the test tubes is 5 ml. The BSA range is 0.05 to 1 mg/ ml. From these different dilutions, pipette out 0.2 ml protein solution to different test tubes and add 2 ml of alkaline copper sulphate reagent (analytical reagent). Mix the solutions well. This solution is incubated at room temperature for 10 mins. Then add 0.2 ml of reagent Folin Ciocalteau solution (reagent solutions) to each tube and incubate for 30 min. Zero the colorimeter with blank and take the optical density (measure the absorbance) at 660 nm. Plot the absorbance against protein concentration to get a standard calibration curve. Check the absorbance of unknown sample and determine the concentration of the unknown sample using the standard curve.

Total Ash

Method of AOAC [10] was employed for determination of ash content of samples. 3-5 grams of sample was weighed in a silica dish, dried at 100°C. Weighed sample was charred till smoke ceases. The crucible was then transferred to muffle furnace and maintained at 550± 5°C for 5 – 6 hrs till white ash was obtained. Then the crucible was cooled in desiccators and weighed. The ash content was calculated in terms of %.

Viscosity

Viscosity of different soymilk beverages was measured using Brookfield Viscometer (Model LVT). The viscosity was determined in centipoises (cp) by multiplying dial factor (1) specified for speed (60 seconds) of spindle number (1).

Storage studies

The soy beverages were packed in sterilized glass bottles, stored at refrigerated temperature for 20 days and sampled at 5 day intervals. During storage total solids, acidity, pH, TSS, protein and overall acceptability was determined.

3. RESULTS AND DISCUSSION

The present investigation was carried out to study the stability of various levels of fruit juices with soymilk and milk whey. The soy based beverages was formulated with different concentration of soymilk and milk whey along with concentrations of fruits juices. The concentration of fruit juices in soy beverages were varied from 40%, 50% and 60% where as concentration of soymilk and milk whey was taken in 1:1 ratio.

Chemical composition of soymilk, milk whey, mango juice and pineapple juice

The data pertaining to nutritional composition of soymilk, milk whey, mango juice and pineapple juice is presented in Table 1. The data revealed that TSS content of soymilk was 5°brix, total solids was 10.2% and acidity was 0.1%. Whereas, protein was 3.1%, fat 2.1%, ash 0.48% and pH was 5.9. In another study Yadav et al. [12] observed that soymilk contains 2.86 – 3.12% protein, 90 - 93.81% moisture, 1.53 - 2% fat, 0.27 – 0.48% ash, 1.53 – 3.90 % carbohydrate calculated as the difference from 100%. In the present investigation the TSS of pineapple juice was found to be 6^{o}brix, total solids were 20.4% and acidity was 0.32%. Similarly protein was 0.5%, ash 0.34% and pH was 4.0. The nutritional composition of whey is also presented in Table 2. The total solids content was calculated as 6.82% and the value was found to be higher than the value calculated by Durham et. al. [13] i.e. 6.06 %. The acidity of whey was calculated as 0.21 % which was same as the value calculated by Durham et. al., [13] i.e. 0.21 %. Whey pH was found to be 6.1 which was higher than the calculated value by Durham et. al. [13]i.e. 5.6 also, the value was found to be higher than the value calculated by Padmavathi et al. [14] i.e. 5.39. The ash content was 0.32 %, while the value calculated by Durham et al. [13] was 0.6%.

Table 2. Proximate composition of whey, soymilk, pineapple and mango

Sample	TSS (°brix)	Total solids (%)	Fat (%)	Protein (%)	pH	Acidity (%)	Ash (%)
Whey	4±0.13	6.82±0.22	0.32±0.01	0.42±0.01	6.1±0.12	0.21±0.01	0.32±0.01
Soymilk	5±0.11	10.2±0.53	2.10±0.02	3.10±0.01	5.9±0.15	0.10±0.02	0.48±0.02
Pineapple	6±0.10	20.4±0.32	-	0.50±0.01	4.0±0.21	0.32±0.01	0.34±0.01
Mango	15±0.72	50.8±1.12	-	0.46±0.12	4.4±0.22	0.20±0.01	0.60±0.01

Whey contained 0.32 % fat content and the value was higher than the values calculate by Durham et. al. [13] i.e. 0.13 %. Whey contained 0.42 % protein content. This value was found to be higher than values calculated by Durham et. al. [13] i.e. 0.30. All these differences may be due to the agro-climatic conditions, species related, feed related, rearing practices, analysis and procurement of whey.

Selection of level of sugar in soymilk-whey blended beverage

Soymilk- whey blend was prepared by incorporating four different levels of sugar (8 %, 10 %, 12 % and 14 %). Control as well as experimental samples was evaluated for their organoleptic acceptability. Mean scores obtained for different sensory attributes are presented in Table 3. Colour and appearance of experimental and control samples of soymilk- whey blend beverage were liked moderately by the judges except soymilk-milk whey blend beverage sample prepared with 12 % sugar, which was rated in the range of liked. Similar observations were recorded by the judges regarding flavour, mouth feel and overall acceptability of soymilk-whey milk samples. It is evident from the table data that judges preferred flavour, body & texture and overall acceptability of soymilk-whey milk sample prepared with 12 % sugar Therefore, the 12 % level of sugar was selected for further studies as it was scored maximum by the judges for all the sensory attributes.

Table 3 Sensory scores of soymilk-whey blended beverage with different levels of sugar

Treatment	Sensory attributes			
Sugar Conc. (%)	**Colour and appearance**	**Mouthfeel**	**Flavor**	**Overall acceptability**
8	7.50±0.75	7.33±0.77	7.16±0.76	7.33±0.67
10	7.16±0.44	6.83±0.98	6.83±0.98	6.94±0.87
12	7.83±0.78	8.00±0.94	7.50±0.88	7.7±0.98
14	6.66±0.98	7.00±0.65	6.83±0.87	6.83±0.87

Physiochemical properties of soymilk-whey blended beverages:
Total soluble solids

The data pertaining to total soluble solid of soy based beverages is shown in Table 4. The total soluble solid of soy beverages increases as the concentration of fruit juice increases in each blend. The total soluble solids are higher in 60% mango blended soy beverages and minimum in control.

Table 4. Physicochemical parameters of soy beverages:

Sample	TSS (°brix)	Acidity (%)	Ash (%)	pH	Protein (ppm)	Viscosity (cp)	Total solids (%)
Control SM+MW	11±1.13	0.30±0.02	0.5±0.01	4.8±0.97	74±3.22	6.02±0.61	17.8±0.34
SM+MW+MJ (40%)	16±1.43	0.31±0.03	0.64±0.02	4.5±0.95	72±2.15	17.6±0.86	21.3±1.12
SM+MW+MJ (50%)	16±1.55	0.33±0.02	0.73±0.03	4.4±0.94	71±4.15	18.75±0.76	22.8±1.11
SM+MW+MJ (60%)	16±1.75	0.34±0.02	0.82±0.05	4.2±0.12	68±4.34	20.5±0.65	23.8±1.54
SM+MW+PJ (40%)	15±1.68	0.40±0.03	0.6±0.02	4.1±0.11	73±1.97	7.4±0.44	16.2±1.43
SM+MW+PJ (50%)	15±1.87	0.43±0.03	0.69±0.04	4.1±0.14	72±2,44	7.6±0.57	17.4±1.32
SM+MW+PJ (60%)	15±1.11	0.47±0.01	0.7±0.05	4.0±0.15	70±3.12	8.5±0.66	18.8±1.03

SM – Soya milk, MJ – Mango juice, MW – Milk whey and PJ – Pineapple juice

Titrable acidity

The data pertaining to percent titrable acidity of soy based beverages is shown in Table 3. It was observed that acidity of soy beverages increases as the concentration of fruit juice increases. The maximum acidity was found in case of 60% pineapple blended soy beverages while minimum acidity was observed in control samples. There is correlation between pH and titrable acidity. Similarly increase in acidity from 0.30 to 0.37 g percent for whey based jack fruit RTS and from 0.28 to 0.34 g percent for mango RTS were reported by Saravana and Manimegalai [15] and Beerh et al. [16] respectively.

Ash content

The data pertaining to ash content of soy based beverages is shown in Table 3. The ash content of various sample of soy blends increases as the concentration of fruit juices increases. Ash content give an indication of minerals present in particular food sample and it is very important in many biochemical reactions which aid physiological functioning of major metabolic processes in human body [17]. The ash value is mainly due to potassium and phosphorous. It is measure of fruits and fruit juice content. Ash content of foodstuff represents inorganic residue remaining after destruction of organic matter [18]. Similar observation was focussed by Saini and Jain [19].

pH

The pH values followed the reversed trend to the acidity in all the samples irrespective of treatment. Data pertaining to pH of soy based beverage is present in Table 3. The pH of soy based beverage was significantly higher in control and it was minimum in 60% pineapple blended soy beverage and also it was observed that increase in fruit portion result in decrease in pH. However, according to Sowonola, et al. [20], the pH of the soymilk was higher than that of kunnu while the addition of soymilk to kunnu gave a higher pH value. The pH value of soymilk-kunnu blend were observed as 4.80, 5.10, 5.50 and 5.70.

Protein

The data pertaining to protein of soy based beverages is shown in Table 4.The protein content of soy beverages should have to be high. To determine protein content, O.D was taken at 660 nm. The protein content of beverages supplemented with mango and pineapple juice increases from 75 to 80 ppm and 70 to 74 ppm. Soybean extraction from ultra-filtration gave protein content of 56.43. It can be used directly to formulate infant foods, high protein beverages, etc., or may be dried and used as a source of good quality protein in food products [21].

Viscosity

The data pertaining to viscosity of soy based beverages is shown in Table 4. The viscosity of soy beverages increases in each sample with the addition of fruit juice. As the concentration of fruit juices increases, the viscosity of soy beverages increases. The higher viscosity was observed in 60% mango blended soy beverage and minimum in case of control.

Total solids

The data pertaining to total solids of soy based beverages is shown in Table 4. The seven samples of soy beverages after physicochemical analysis gave an increase in value of total solid. The total solid is maximum in 60% mango blended soy beverage. Total solid and composition of soy extract will depend on the bean: water ratio and pH during extraction proportionally [21].

Sensory Evaluation of Soymilk-whey blended beverages

The data pertaining to the sensory evaluation of soy blended beverages is presented in Table 5. It was observed that 50% mango blended beverages (soymilk, milk whey, 0.4% citric acid and 50% of mango juice) was most accepted and the control sample (soymilk, milk whey and 0.4% citric acid) was least accepted.

Table 5 Sensory Evaluation of Soy Beverages

Sample	Flavor	Taste	Mouth feel	Color /Appearance	Overall acceptability
Control SM+MW	5.2±0.11	5.2±0.14	6.0±0.15	6.2±0.13	5.65±0.13
SM+MW+MJ (40%)	7.4±0.14	7.2±0.16	6.8±0.13	7.4±0.15	7.21±0.16
SM+MW+MJ (50%)	8.2±0.15	8.2±0.18	7.6±0.15	7.8±0.11	7.95±0.12
SM+MW+MJ (60%)	7.6±0.32	8.0±0.21	7.6±0.12	8.2±0.21	7.85±0.24
SM+MW+ PJ (40%)	7.4±0.34	7.6±0.12	6.8±0.16	7.0±0.22	7.21±0.22
SM+MW+ PJ (50%)	8.0±0.42	8.0±0.15	7.6±0.14	7.2±0.11	7.71±0.15
SM+MW+ PJ (60%)	7.8±0.46	7.8±0.11	7.8±0.17	7.6±0.21	7.75±0.17

SM – Soya milk, MJ – Mango juice, MW – Milk whey and PJ – Pineapple juice

Effect of storage on physiochemical properties of soymilk-whey blended beverages

The samples of soy beverages were kept in refrigerator and analyzed for quality at 5 days intervals over a period of 20 days. The samples were subjected to physicochemical analysis and sensory evaluation at weekly intervals.

TSS

The data pertaining to pH of soy based beverages is shown in Table 6. It was observed that the sample stored in refrigeration temperature did not show any changes in TSS content during the storage period. Similarly the whey based jack fruit RTS beverages did not show any change in TSS during storage period of 3 months [15]. Similar observation was seen by Pota et al. [22] during storage of pomegranate fruits.

Acidity

The data pertaining to acidity of soy based beverages is shown in Table 6. A slight variation in the acidity was noted between the beverages throughout the study period. The increase in acidity of the samples stored in the refrigerated temperature was observed during storage. It was noted that there was no changes in their acidity upto 5 days. The higher acidity is found in case of 60% pineapple blended soy beverages and minimum in case of control. Increase in acidity during storage might be due to the formation of organic acids by degradation of ascorbic acid. Ascorbic acid is sensitive to heat and is oxidized quickly in the presence of oxygen [23].

Hence, it might have been destroyed during processing and subsequently during storage period due to its oxidation. Similar reduction in ascorbic acid content was recorded by Roy and Singh [24] in bael nector, Kalra et al. [25] in mango-papaya blends and Pandey and Singh [26] in guava RTS beverages. An increase in acidity from 0.30 to 0.37 g percent for whey based jack fruit RTS and from 0.28 to 0.34 g percent for mango RTS were reported by Saravana and Manimegalai [15], and Beerh et al. [16] respectively. Similarly acidity of guava fruit bar increased while pH decreased during storage period reported by Gowda et al. [27].

pH

The data pertaining to pH of soy based beverages is shown in Table 6. During storage the drop in pH value was due to high acidity due to initial increase in the total soluble solids contents which potentiate the release of bound nutrients. Similarly significant pH changes were noticed during storage of papaya fruit bar by Arun et al. [28].

Protein

The data pertaining to protein of soy based beverages is shown in Table 6. The protein content of soy beverages should have to be high. The protein content of soy based beverages did not change during storage period. The 60% mango blended soy beverage shows high protein content which did not change during storage period.

Viscosity

The data pertaining to viscosity of soy based beverages is shown in Table 6. Decrease in the viscosity of soy based beverages stored in the refrigerated temperature was observed during storage. It was observed that as the concentration of total solids decreases the viscosity also decreases during storage period.

Total solids

The data pertaining to total solids of soy based beverages is shown in Table 6. During storage it was observed that the total solid content of soy blended beverages decreases slightly and this decrease during storage period may be due to fermentative changes taking place. Similarly the total solids of soy beverages decrease slightly as reported by Naveen and Kamini [29].

Effect of storage on sensory evaluation of soymilk-whey blended beverages

The data pertaining to overall acceptability of soy based beverages is shown in Table 6 According to storage study of soy based beverages, it was found that the 50% mango soy beverage was best accepted among other soy based beverages after 20 days storage.

Table6: Effect of storage on physicochemical properties of various blends of soy beverages

	Samples	Control (SM+MW)	SM+MW+MJ (40%)	SM+MW+MJ (50%)	SM+MW+MJ (60%)	SM+MW+PJ (40%)	SM+MW+PJ (50%)	SM+MW+PJ (60%)
TSS	**0 day**	11	16	16	16	15	15	15
	5 day	11	16	16	16	15	15	15
	10 day	11	16	16	16	15	15	15
	15 days	11	16	16	16	15	15	15
	20 days	11	16	16	16	15	15	15
Acidity (%)	**0 day**	0.30±0.02	0.31±0.03	0.33±0.02	0.34±0.02	0.4±0.02	0.43±0.01	0.47±0.01
	5 day	0.30±0.01	0.31±0.04	0.33±0.03	0.34±0.01	0.40±0.01	0.43±0.01	0.47±0.03
	10 day	0.31±0.13	0.32±0.01	0.34±0.02	0.35±0.02	0.41±0.01	0.44±0.02	0.48±0.05
	15 days	0.32±0.02	0.33±0.01	0.35±0.02	0.36±0.02	0.42±0.02	0.45±0.02	0.49±0.04
	20 days	0.34±0.02	0.35±0.02	0.36±0.01	0.37±0.01	0.430.02	0.46±0.03	0.5±0.04
pH	**0 day**	4.8±0.12	4.5±0.17	4.4±0.16	4.2±0.15	4.1±0.21	4.1±0.21	4.0±0.21
	5 day	4.8±0.16	4.5±0.19	4.4±0.19	4.2±0.18	4.1±0.22	4.1±0.18	4.0±0.22
	10 day	4.7±0.17	4.4±0.17	4.2±0.13	4.1±0.13	4.0±0.19	4.0±0.19	3.9±0.21
	15 days	4.5±0.13	4.3±0.13	4.1±0.22	4.0±0.21	3.9±0.21	3.9±0.17	3.8±0.17
	20 days	4.4±0.18	4.2±0.16	4.0±0.15	3.9±0.24	3.8±0.28	3.8±0.16	3.7±0.19
Protein (ppm)	**0 day**	74	72	71	68	73	72	70
	5 day	74	72	71	68	73	72	70
	10 day	74	72	71	68	73	72	70
	15 days	74	72	71	68	73	72	70
	20 days	74	72	71	68	73	72	70
Viscosity (Cp)	**0 day**	6.02±0.32	17.6±0.42	18.75±0.43	20.5±0.53	7.4±0.11	7.6±0.21	8.5±0.13
	5 day	5.98±0.42	16.61±0.23	17.6±0.75	19.73±0.43	6.92±0.13	6.81±0.15	7.19±0.16
	10 day	5.01±0.52	15.93±0.34	16.09±0.64	18.92±0.65	6.33±0.15	6.19±0.12	6.66±0.12
	15 days	4.63±0.36	15.63±0.54	15.83±0.54	18.01±0.53	5.92±0.11	5.83±0.15	6.03±0.11
	20 days	4.03±0.53	14.08±0.56	15.09±0.64	17.62±0.26	5.01±0.11	5.16±0.17	5.63±0.14
Total solid (%)	**0 day**	17.8±1.13	21.3±2.21	22.8±1.14	23.8±1.52	16.2±2.23	17.4±1.53	18.8±1.11
	5 day	17±1.54	21.1±1.98	22.40±1.15	23.4±1.53	16±2.43	17±1.74	18.1±1.18
	10 day	16.4±1.23	20.8±1.23	22.0±1.17	23±1.22	15.8±2.34	16.4±1.90	17.7±1.12
	15 days	15.6±1.09	20.3±1.76	21.6±1.21	22.4±1.53	15.3±2.12	15±1.23	17.2±1.92
	20 days	15±1.12	20.0±2.10	21.2±1.11	22±1.64	14.6±1.94	14.8±1.43	17.0±1.21
Overall acceptability	**0 day**	5.65±0.12	7.2±0.76	7.95±0.45	7.85±0.90	7.2±0.43	7.7±0.86	7.75±0.45
	5 day	5.65±0.42	7.2±0.86	7.95±0.73	7.85±0.45	7.2±0.64	7.7±0.67	7.75±0.65
	10 day	5.62±0.46	7.0±0.45	7.91±0.45	7.82±0.76	7.1±0.55	7.4±0.57	7.71±0.82
	15 day	5.6±0.67	6.8±0.74	7.9±0.76	7.8±0.16	7.0±0.65	7.2±0.67	7.68±0.64
	20 day	5.57±0.75	6.7±0.43	7.88±0.87	7.78±0.64	6.8±0.94	7.0±0.86	7.65±0.75

SM – Soya milk, MJ – Mango juice, MW – Milk whey and PJ – Pineapple juice

REFERENCES

[1]. Patil, G R., Patel, A., Gupta, S.K and Rajor, R.B. (1984), "Manufacture of whey soy beverages," Journal of Food Technology, 21(5): 340-45.

[2]. Govindaswamy, T.N. (2006), "The splender of soybean – in the noon meal scheme," Kisan world, 5:25.

[3]. Tripathi, A.K and Misra, A.K. (2005), "Soybean – a consummate functional food," Journal of Food Science Technology, 42(2): 111-19.

[4]. Waggle, D.H. (2000), "Soy protein and health," Food Aust, 52: 31-36.

[5]. Nelson AI, (1976), "Illinois process for preparation of soy milk," Journal of Food Science, 41: 57-61.

[6]. Vijayalakshmi, K. and Vaidehi, M.P. (1982), "Evaluation of tofu and its products prepared from soymilk and combination with sunflower seed milk and skim milk," Journal of Food Science Technology, 19 (4): 139-42.

[7]. Bus, A.E.M. and Worsley (2003), "Consumer's Sensory and nutritional perception of three types of milk," Public Health Nutrition, 6(2): 201-208.

[8]. Henry, S. Laswai, (2009), "Use of locally available flavouring material in suppressing the beany taste in soymilk," African Journal of Food Agriculture Nutrition and Development, 9(7): 1548-1560.

[9]. Ajila, C.M. (2008), "Protection against hydrogen peroxide induced oxidative damage in rat erythrocytes by Mangifera indica L. peel extract," Food and Chemical Toxicology, 46(1), 303-309.

[10]. AOAC (1990), "Official methods of analysis. 15th Edition," Association of official analytical chemists. Washington.

[11]. Lowry, O.H., Rosebrough, N.J., Farr, A.L., and Randall, R.J. (1951), "Journal of Biology Chemistry," 193: 265.

[12]. Yadav, D.N., Chauhan, G.S., Chauhan, O.P., Sharma, P., Bajpai, A. (2003), "Quality Evaluation of Curd Prepared from Milk-Soymilk Blends," Journal of Food Science Technology, 40 (4): 403

[13]. Durham, R.J., Hourigan, J.A., Singh, R.W. and Johnsen, R.L. (1997), "Whey fractionation: wheying up consequences," Food Australia, 49: 460-465.

[14]. Padmavathi, T.K., Thangaraju. P., Subhramanium, V.S. (2007), "Comparative analysis of cheese and channa whey," Department of Dairy Science, Madras Veterinary College, Chennai.

[15]. Saravana, R. Kumar and Manimegalai. G (2002), "Studies on whey based jack fruit RTS beverages," Beverages and Food World, 29: 57-58.

[16]. Beerh, O.P., Kulkarni, S.G., Berry, S.K., Kalra, C.L., Sehgal R.C. and Kaur S. (1989), "Suitability of some mango varieties available in punjab for ready-to-serve beverages," Beverages and Food World, 16: 28-30.

[17]. Ashaye, O.A. and Adeleke T.O. (2009), "Quality Vegetables. An overview of the Cultivated attributes of stored Roselle jam," International Food Species. Natural Resources Institute,Chatham,UK. Research Journal, 16: 363-371.

[18]. Ranganna, S. (1986), "Sensory Evaluation General Instruction for Microbiological Examination," 2nd Edn., Tata McGraw Hill Publishing Co.Ltd., New Delhi, pp: 670-686.

[19]. Saini, S.P.S. and S. Jain, (1995), "Effect of seasonal maturity and treatment on storage stability of patharnakh pear juice concentrates," Research India, 40: 289-292.

[20]. Sowonola, O. A., Tunde-Akintunde, T. Y., & Adedeji, F. (2005), "Nutritional and sensory qualities of soymilk kunnu blends," African Journal of Food, Agriculture, Nutrition and Development, 5(2): 1-12.

[21]. Omosaiye. O, Cheryan. M and Matther M.E. (1978), "Removal of oligosaccharides from soybean water extracts by ultra filtration," Journal of Food Science, Vol. 43, No. 1, pp. 354-360.

[22]. Pota, S.O., S. Ketsa and M.L.C. Thongtham, (1987), "Effect of packaging material and temperature on quality and storage life of pomegranate fruits," Journal of National Science, 23: 328-333.

[23]. Mapson, C.W. (1970), "Vitamins in fruits," In: Biochemistry of fruits and their products. Vol. 1, pp. 376-387.

[24]. Roy, S.K., Singh, R.N (1979), "Studies on utilization of bael fruits for processing preparation and preservation of bael fruit products," Indian Food Pacter. 33: 9-14

[25]. Kalra, S.K., Tandon, D.K., Singh B.P. (1991), "Evaluation of mango-papaya blended beverages," Indian Food Packer, 45: 33-36.

[26]. Pandey, A.K., Singh I.S. (1999), "Studies on preparation and preservation of guava ready- to-serve beverages," Indian Journal of Horticulture, 56: 130-132.

[27]. Gowda, A.S.M., Nallakurumban and Kalaiselvan, (2005), "Studies on storage stability of guava fruit bar in different packaging materials," Beverages and Food World, 32: 80-81.

[28]. Arun, K., Lakshmi R.D and Vimala V. (1998), "Development and storage stability of cereal-based papaya powder," Journal of Food Science Technology, 35: 250-254.

[29]. Naveen M. and Devi Kamini (2008), "Development of acceptable soy based beverages using different adjuncts and additives," Beverages and Food World, pp. 48-50.