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Effect of Skim Milk in Soymilk Blend on the Quality of Ice Cream

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Abstract: Four types of soymilk blends were prepared for the preparation of a new variety of ice cream i.e. T_1, T_2, T_3 and T_4 in 1:9, 2:8, 3:7 and 4:6 ratios of soy flour: skim milk respectively while plain ice cream with vanilla flavour (T_0) was kept as control. The physico-chemical, sensory as well as micro elements detection of ice cream were performed. It was observed that soymilk with maximum quantity of skim milk improved taste, flavour and mouth feel product. Chemical composition of soymilk blend showed 81.80% moisture, 18.20% total solids, (14.35% milk solids-not-fat and 3.85% fat. Plain ice cream (T_0) contained 65.815% moisture, 34.176% total solids, 0.7423% ash, 9.850% fat, 3.345% protein, 14.880% sucrose and 5.521% lactose. Acidity determined was 0.190% and pH was 6.71. Statistically high changes were noted for overrun, acidity and lactose while significant change was noted for pH with the increase in storage period (from 0 to 30 days). It was found that ice cream from soymilk blend (T_4) contain greater amount of Ca (2.01 mg/100 ml) and Fe (0.44 mg/100 ml) as compared to skim milk (0.58 mg/100 ml Ca and 0.22 mg/100 mL Fe). Sensory tests showed that T_2 sample was superior to T_4, which obtained lowest score. Large quantity of skim milk in soymilk improved quality of ice cream, and resulted in decline beany flavour of soy beans. It was concluded that soymilk blend can be used for the preparation of frozen desserts especially ice cream. The ice cream prepared from soymilk blend having 20 g soy flour: 80 g skim milk (T_2) was of good quality in respect of sensory characteristics such as colour, taste, flavour and overall acceptability. Physico-chemical characteristics showed that T_2 sample contained 65.795% moisture, 34.182% total solids, 0.7512% ash, 9.856% fat, 3.430% protein, 14.885% sucrose and 5.462% lactose. Acidity value was 0.19% whereas pH was found to be 6.709.

Key words: Skim milk, soya milk, ice cream, storage

Introduction

In addition to animal proteins, soymilk is used as vegetable proteins source in most of the countries as there is low availability of animal proteins due to increasing world population (Chien and Synder, 1983). Soymilk and cow milk have similar proteins contents (3.5-4.0%) and are fairly close in their amino acid pattern, except that soymilk is deficient in sulfur containing amino acid (Singh, 1978). Soymilk has not gained due popularity, chiefly because of its beany flavour, presence of lipoxygenases and astringency and is hence presently used as milk substitute by a group of peoples who could not tolerate cow's milk (Mittal *et al.,* 1976).

Lipoxygenase is inactivated by heat treatment to improve flavour of soymilk, but it resulted in lowering of protein solubility. Therefore it is necessary in milk manufacturing to grind soybeans very thoroughly to disperse the protein (Ediriweera *et al.,* 1987). The other flavour defect in soymilk is astringency and it has been recognized as the throat catching factor. Soymilk is made less astringent by the addition of skim cow's milk, $CaSO_4$ or citric acid (Chien and Synder, 1983).

Soymilk blend is used in the preparation of frozen desserts especially ice cream (Sivaramakrishnan *et al.*, 1992). Ice cream is a frozen mixture of a combination of components of milk (carbohydrates, proteins, fats, vitamins and minerals), sweeteners, stabilizers, emulsifiers and flavours. It may be defined as partially frozen foam with air contents of 40 to 50% by volume (Larson and Friberg, 1990).

Ice cream is a nutritious, healthful and relatively inexpensive food, supplies approximately 200 calories, 3.99 g protein, 0.31 g calcium, 0.10 g phosphorus, 0.14 mg iron, 548 IU vitamin A, 0.038 mg thiamine and 0.23 mg riboflavin (Arbuckle, 1986). The quality of ice cream depends upon the ingredients used; suitable stabilizer is the most important. Hydrophilic plant gums in ice cream mix reduce the amount of free water and give stability to the finished product. Now a day's various types of stabilizers e.g. carboxy methyl cellulose, gelatin, guar gum and sodium alginate are being used in food industry (Glicksman, 1962).

The project was therefore planned to prepare ice cream with less beany flavour and to increase its acceptability using different ratios of skim milk in soymilk blend. The quality of ice cream was evaluated by sensory evaluation and physico-chemical analysis and micro elements such as Na, K, Ca, Mg, and Fe were determined through spectrophotometry.

Materials and Methods

Raw materials: Skim milk powder, milk cream, milk, sugar, stabilizers and flavours were purchased from local market while soybean (NARC 90-1) was purchased from Ayub Agricultural Research Institute, Faisalabad.

Proximate analysis of soybean: Soybean was analyzed for moisture, total solids, ash, crude fat, crude protein, crude fiber and nitrogen free extract according to the methods described by A.A.C.C. (1983).

Preparation of Soymilk: Soybean was cleaned manually to remove dust, damaged seeds, weeds and metals. Pre-cleaned soybean was soaked in H_2O at pH 7 for 1 hour at 80-100 ^oC. Pre-soaked soybean was dehulled manually, sun dried and ground to obtain fine powder.

Preparation of soymilk blends: Four types of soymilk blend were prepared from soy flour and skim milk powder. Each was dissolved in water to make slurry and diluted up to 1000 ml with water to prepare blends (Shahid, 2000).

Treatments	Soy flour (g)	Skim milk (g)
T_0	0	100
T_1	10	90
T_2	20	80
T_3	30	70
T_4	40	60

Homogenization: These blends were homogenized at 7000 rpm for 5 minutes (Johnson and Snyder, 1978).

Pasteurization: These soy flour-skim milk blends were pasteurized at 70-80 ^oC for 15 minutes and then cooled up to 25 ^oC (Chien and Snyder, 1983).

Chemical analysis of soymilk blends and milk cream: The Soymilk blends as well as milk cream were analyzed for total solids, ash, crude fat, crude protein, and acidity according to the methods described by A. A. C. C. (1983). pH was determined by using the pH meter. For determining acidity, to 10 ml sample few drops of phenolphthalein solution were added in it titrated against 0.1 N NaOH to faint pink colour. Acidity was calculated as.

$$\text{Acidity (\%)} = \frac{\text{Volume of 0.1N NaOH used}}{\text{Weight of milk}} \times 100$$

Preparation of Ice Cream

Formulation: Ice cream was prepared from soymilk-skim milk blends according to recipe given by Arbuckle (1986). The formula used for the preparation of ice cream contained 10 % fat, 13.2 % sugar, 0.3% stabilizer, 36-40% total solids and 0.3% vanilla flavour (used only in control sample). Plain ice cream mix with vanilla flavour was used as control sample (T_0). It contained 100g skim milk but no soy flour.

Addition of stabilizer: Carboxy methyl cellulose (CMC) was added at a concentration of 0.35 % in the mixes as a stabilizer.

Process of manufacturing: The processing steps for ice cream manufacturing include weighing and mixing, pasteurization, homogenization, cooling and ageing, freezing, hardening, packaging and storage.

I) I. Accurately weighed dry ingredients were mixed with liquid ingredients by means of manual stirring for 10 minutes to get uniform mixture.
   ii. Mix was pasteurized at 80 ^oC for 15 minutes to destroy pathogenic organisms and to check enzymatic activity.
   iii. Mix was homogenized at 7000 rpm for 30 seconds. Homogenization is known to check creaming and improving appearance of the ice cream.
   iv. After homogenization, the mix was cooled down and stored at 4 ^oC for 5-6 hours for ageing. Ageing increased the viscosity of the product. If ageing is not done then loose stand up and very wet product on drawing from freezing machine is obtained. After ageing, milk and vanilla flavour was added.

II) Ice cream was prepared with manually operating ice cream machine. The mix was frozen at -5 to -6 ^oC. When the desired consistency had been attained, the product was filled into cups. The cups were transferred to the hardening unit maintained at -25 ^oC and the ice cream was kept for 24 hours. These cups were then transferred to deep freezers at -20 ^oC.

Storage studies: The storage studies were made for a period of 30 days at 10 days intervals. Physico-chemical analysis and sensory evaluation of product were conducted at 0, 10, 20 and 30 days intervals.

A. Physico-chemical analysis

Overrun: Overrun of ice cream samples was calculated by using the method given by Egan *et al.* (1987). The increase in volume caused by whipping air into the mix during the freezing process is known as overrun.

$$\text{\% Overrun by volume} = \frac{\text{Vol. of ice cream} - \text{Vol. of mix}}{\text{Vol. of mix}} \times 100$$

Moisture, total solids, ash and crude protein was determined according to the methods described by A. A. C. C. (1983).

pH: The pH of ice cream mix was tested with a pH meter. Each sample was mixed thoroughly and pH was noted (A. O. A. C., 1984).

Acidity: Acidity was determined by taking 10 g sample of ice cream in a porcelain dish and adding distilled water to make volume up to 20 ml. Then a few drops of phenolphthalein indicator were added and the material was titrated against 0.1 M NaOH to a light pink end point (Egan *et al*., 1987). The percent acidity was calculated as follows.

$$\text{Percent acidity (as lactic acid)} = \frac{0.009 \times \text{Vol. of M/10 NaOH}}{\text{Weight of the sample}} \times 100$$

Fat: The fat contents of ice cream were estimated by Gerber method (Divide, 1977). In this procedure, ice cream was brought to the room temperature. A measured quantity (10 ml) of concentrated H_2SO_4 was taken into the cream butyrometer to which 5 g of the sample were carefully added followed by addition of 1 ml of amyl alcohol. The Gerber tube was stoppered and shaken until all the lumps of ice cream completely disappeared. It was then centrifuged for 6 minutes. The butyrometer was conditioned in water bath and then reading was recorded from the scale on the neck, after adjusting the volume by the addition of water if necessary.

Lactose: Fehling's solution A and B (10 ml each) were titrated against 3 percent ice cream solution (Lees, 1971). Lactose was calculated as follows.

$$\text{Lactose \%} = \frac{\text{Factor from table} \times 100 \times 3/100}{\text{Titer}}$$

Sucrose: A 40 ml of 10 percent ice cream solution was taken in a conical flask and 5 ml of concentrated HCl was added and cooled in a water bath for 10 min. It was then neutralized with 50 percent NaOH solution. The volume was then made 200 ml and Fehling's A and B solutions (10 ml) were titrated against it (Lees, 1971). Sucrose was calculated as follows.

Sucrose percentage = 0.98 (Total sugar- lactose) X 10/100

Sensory evaluation: All the ice cream samples were sensory rated for appearance, taste, flavour, body/texture and overall acceptability by a panel of 5 judges using the 9-point hedonic scale (Larmond, 1977). Excellent quality ice cream was numbered as 9 and poor quality ice cream was numbered as 1 in this scale.

B. Micro-Elements: Micro-elements such as Na, K, Ca, Mg and Fe were determined through spectrophotometery in the product (A. O. A. C., 1990). The procedure for their determination is as follows.

1 g Sample of ice cream was taken in a conical flask and 10 ml of concentrated HNO_3 were added in the flask, heated at 60-80 ^{o}C for 15 minutes, and again heated at 100 ^{o}C for 15 minutes. Sample was cooled and then 5 ml of concentrated perchloric acid were added, heated at 60-80 ^{o}C for 15 minutes, again heated at 350 ^{o}C until 1-2 ml of digested material was left in the flask and volume was made up to 100 ml with distilled water. Micro-elements were determined from this solution by using spectrophotometer.

Results

The primary aim of this investigation was to evaluate the use of soymilk-skim milk blend in ice cream. Four blends of soymilk-skim milk (T_1, T_2, T_3 and T_4) and of skim milk (T_0) as control were tried in the ice cream formulations.

Proximate analysis of raw materials: Soybean were analyzed for moisture, total solids, fat, protein and ash while soymilk blend and milk cream was analyzed for moisture, total solids, milk solids-not-fat and fat contents (Table 1).

Physico-chemical analysis of ice cream: The physico-chemical analysis of fresh ice cream is presented in the Table 2. The data revealed a difference in the overrun, moisture, total solids, ash, pH, acidity, fat, protein, sucrose and lactose values among the different ice cream products.

Highest overrun (80.995) was observed in T_4 sample where as lowest overrun (80.920) was obtained in T_1 sample. The highest moisture was recorded in T_0 i.e. 65.815% (plain ice cream) and lowest moisture in T_4 (65.792%).

Maximum total solids were present in T_4 sample (34.190%) while T_0 (34.176%) contained minimum content and highest ash was recorded in T_2 sample (0.7512%) while the lowest value of ash was observed in T_0 sample (0.7423%). pH and acidity values were nearly same for all the samples. At 0 day (at the time of manufacturing) T_0 contained lowest percentage of fat, protein, sucrose and lactose as compared to T_1, T_2, T_3 and T_4.

Effect of storage on physico-chemical characteristics of ice cream: Physico-chemical characteristics of ice cream were analyzed after 0 day, 10 days, 20 days and 30 days of storage period (Table 3). During 30 days of storage, overrun was decreased in all the samples. At the end of 30 days minimum overrun (80.181%) was recorded in T_1 sample where as maximum overrun (80.244%) was recorded in T_4 sample. Maximum moisture (65.802%) level was in T_0 and minimum in T_4 sample while maximum ash (0.7510%) was recorded in T_2 and minimum (0.7423%) in T_0 after 30 days of storage. It is evident from this data that there was a gradual decrease in pH of all the treatments during storage of 30 days. Maximum decrease in the pH value, at the end of 30 days of storage was found in T_4 sample and minimum took place in T_2 sample while the fats and proteins contents of all the samples remain nearly unchanged during storage at -20 ^{o}C.

Table 1: Proximate composition of soybean, soy milk blend and milk cream (%)

	Soybean (%)	Soymilk blend (%)	Milk cream (%)
Moisture	7.50	81.80	41.63
Total solids	92.50	18.20	58.37
Milk solids not fat	-	14.35	9.69
Fat	19.73	3.85	48.68
Protein	34.81	-	-
Ash	4.57	-	-

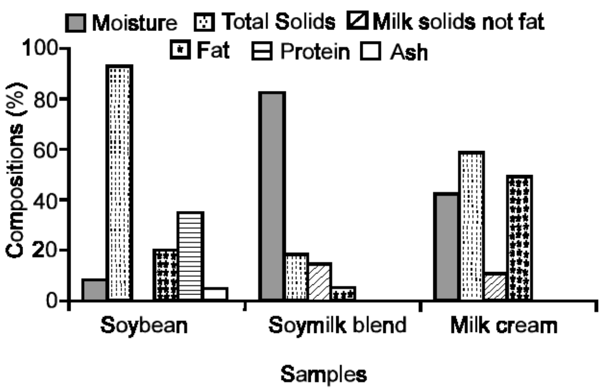

Fig. 1: Proximate composition of soybean, soymilk blend and milk cream

Sensory evaluation of ice cream: The ice cream prepared from soymilk blend, was evaluated for sensory characteristics (colour, taste, flavour, body/texture and overall acceptability).

At 0 day, judges rated the T_0 sample as best with regard to its colour, taste and flavour body texture while T_4 sample obtained least score. The results indicated that taste and flavour of all ice cream samples was decreased throughout the storage period. T_0 sample exhibited better flavour stability on storage. At 0 day, the best texture and body characteristics were observed in case of T_1 sample. All the ice cream samples retained their textural quality up to the end of storage period.

Overall acceptability was determined by using questionnaire. The judges indicated decline in overall acceptability during storage by giving low score. At zero days, maximum score was recorded for plain ice cream (7.7) while minimum for T_4 sample (7.0). At the end of 30 days of storage, the highest decrease was found for T_4 sample and the lowest for T_0 sample.

Micro elements: The data about micro elements (Na, K, Ca, Mg and Fe) of ice cream is presented in Table 4. It is clear from the Table that T_0 sample contained 0.58 mg/100 ml Ca and 0.22 mg/100 ml Fe, while T_4 sample contained 2.01 mg/100 ml Ca and 0.44 mg/100 ml Fe.

Discussion

Chemical analysis of milk cream and soy milk blend showed that milk cream contained less concentration of moisture and milk solids not-fat while it contained greater concentration of total solids and fat than skim milk blend (Table 1) (Fig. 1).

Potter and Hotchkiss (1995) reported that usual range of overrun in ice cream should be from 70 to 100% which were in line of our work. A substantial decrease in the overrun was observed after 30 days storage of ice cream, may be due to the shrinkage of ice cream. Potter and Hotchkiss (1995) described that the shrinkage in the ice cream during storage was due to the loss of air from ice cream causing it to loss volume. They reported that ice cream contained 35 to 37% total solids and 63 to 65% moisture contents. The findings of this research are similar to those reported above. Total solids in ice cream play an important role on the quality of ice cream. If these are in excess then curded texture could result while low contents resulted in ice crystal formulation and coarse texture.

Increasing trend of ash was recorded in all the treatments with the increase of storage periods but the effect of treatments and storage periods were found non-significant statistically (Table 3). Keller *et al*. (1987) reported 0.73% ash in dairy ice cream.

The reason for the decrease in pH might be due to increase in titrable acidity. Acidity causes changes during storage which affects the pH a well as acceptance of ice cream. The results of this study are similar to those reported by Siddique *et al*. (1988) who found that there was a gradual increase in acidity on storage of ice cream. Normal titrable acidity of ice cream is 0.187%. Acidic flavour is caused due to the growth of the lactic acid bacteria, which produced lactic acid during storage (Marshell and Arbuckle, 1996).

Fat affects all aspects of food perception including appearance, texture, flavour and mouth feel. The fat is also a concentrated source of calories and contributes heavily to the energy value of ice cream (Potter and Hotchkiss, 1995). According to US definition and standard of identity for ice cream, it must contain a minimum of 10 percent fat (Guinard *et al*., 1996). The results of this study are similar to the findings of Guinard.

One important role of proteins in ice cream is their ability to encapsulate the air cells during the freezing step. The standard for protein in case of ice cream was given as 3.28% by Keller *et al*. (1987). Protein contents of ice cream studied in this research were about 3.4%.

Increasing the sugar content of ice cream causes a smooth texture, because it lowers the freezing point, the amount of unfrozen material is increased, increased viscosity and free water contents declined (Marshell and Arbuckle, 1996). Sugar not only adds sweetness to the product but also lowers the freezing point of ice cream mix so that it does not freeze solid in the freezer (Potter and Hotchkiss, 1995). The results of this study are in

Table 2: Physico-chemical characteristics of freshly prepared (0 day) ice cream (%)

	T_0	T_1	T_2	T_3	T_4
Overrun	80.932	80.920	80.953	80.973	80.995
Moisture	65.815	65.808	65.795	65.802	65.792
Total solids	34.176	34.180	34.182	34.187	34.190
Ash	0.7423	0.7502	0.7510	0.7511	0.7512
pH	6.710	6.710	6.709	6.710	6.708
Acidity	0.190	0.190	0.190	0.190	0.190
Fat	9.850	9.854	9.856	9.855	9.853
Protein	3.345	3.414	3.427	3.428	3.430
Sucrose	14.880	14.890	14.885	14.881	14.880
Lactose	5.521	5.464	5.462	5.460	5.480

T_0 = Plain ice cream with vanilla flavour as control. T_1 = Ice cream from mix containing 10 g soy flour: 90 g skim milk. T_2 = Ice cream from mix containing 20 g soy flour: 80 g SM. T_3 = Ice cream from mix containing 30 g soy flour: 70 g SM. T_4 = Ice cream from mix containing 40 g soy flour: 60 g SM.

Table 3: Effect of storage on physico-chemical characteristics of ice cream (%)

Storage Period (Days) T_0	Overrun	Moisture	Total solids	Ash	pH	Acidity	Fat	Protein	Sucrose	Lactose
0	80.932	65.815	34.176	0.7423	6.710	0.190	9.850	3.345	14.880	5.521
10	80.684	65.806	34.178	0.7423	6.624	0.192	9.850	3.342	14.879	5.489
20	80.371	65.802	34.180	0.7423	6.539	0.193	9.850	3.343	14.879	5.380
30	80.191	65.802	34.180	0.7423	6.495	0.196	9.850	3.343	14.879	5.271
Storage Period (Days) T_1										
0	80.920	65.808	34.180	0.7502	6.710	0.190	9.854	3.414	14.890	5.464
10	80.590	65.804	34.180	0.7501	6.630	0.192	9.854	3.414	14.881	5.375
20	80.300	65.802	34.185	0.7501	6.540	0.195	9.854	3.412	14.881	5.282
30	80.181	65.800	34.188	0.7501	6.500	0.196	9.853	3.410	14.880	5.195
Storage Period (Days) T_2										
0	80.953	65.795	34.182	0.7510	6.709	0.190	9.856	3.427	14.885	5.462
10	80.692	65.792	34.182	0.7511	6.628	0.191	9.856	3.427	14.881	5.371
20	80.390	65.792	34.190	0.7511	6.535	0.193	9.855	3.427	14.877	5.278
30	80.210	65.790	34.192	0.7510	6.502	0.195	9.855	3.425	14.876	5.190
Storage Period (Days) T_3										
0	80.973	65.802	34.187	0.7511	6.710	0.190	9.855	3.428	14.881	5.460
10	80.723	65.801	34.187	0.7511	6.625	0.191	9.855	3.428	14.879	5.362
20	80.422	65.800	34.190	0.7511	6.541	0.193	9.854	3.427	14.878	5.273
30	80.225	65.795	34.190	0.7509	6.494	0.196	9.853	3.427	14.878	5.181
Storage Period (Days) T_4										
0	80.995	65.792	34.190	0.7512	6.708	0.190	9.853	3.430	14.880	5.480
10	80.714	65.792	34.190	0.7509	6.627	0.191	9.853	3.426	14.880	5.370
20	80.432	65.790	34.194	0.7509	6.539	0.193	9.852	3.426	14.876	5.270
30	80.244	65.788	34.195	0.7508	6.491	0.195	9.852	3.425	14.875	5.184

T_0 = Plain ice cream with vanilla flavour as control. T_1 = Ice cream from mix containing 10 g soy flour: 90 g skim milk. T_2 = Ice cream from mix containing 20 g soy flour : 80 g SM. T_3 = Ice cream from mix containing 30 g soy flour: 70 g SM. T_4 = Ice cream from mix containing 40 g soy flour: 60 g SM.

agreement with the findings of Gwiszczynska and Kaluziak (1971) who found no change in sucrose content during storage of the ice cream.

The gradual decrease in lactose on storage of the products could be due to the conversion of lactose into lactic acid by bacteria. Sandy texture is detected when large quantities of lactose crystals are formed in the ice cream (Potter and Hotchkiss, 1995). Buffalo milk contains 4.83 percent lactose whereas cow's milk contains 4.9 percent lactose (Considine, 1982). The results of this study are similar to the findings of Siddique *et al.* (1988) who noticed that there was a gradual decrease in lactose on storage of ice cream.

Ice crystals, air cells, fat globules, unfrozen liquid protein and gel structure contribute towards the appearance of ice cream.

Taste is an important attribute for the acceptance of ice cream. A proper balance of sweetness has to be maintained in ice cream to produce acceptable taste. The reason for the better taste of the product might be due to the addition of skim milk in soymilk because skim milk improves the taste of soymilk blend used for the

Table 4: Micro-elements

Treatments	Na(mg/100ml)	K(mg/100ml)	Ca(mg/100ml)	Mg(mg/100ml)	Fe(mg/100ml)
T_0	13.51	18.18	0.58	0.14	0.22
T_1	17.56	11.98	0.86	0.05	0.28
T_2	17.56	11.98	1.20	0.03	0.32
T_3	16.21	12.60	1.50	0.10	0.39
T_4	17.56	11.98	2.01	0.02	0.44

product. Results showed that astringency (taste) of soymilk blend decreases with the increase of quantity of skim milk in soymilk. Same results were found by Chien and Snyder (1983). Flavour is the most important factor in acceptance of the frozen desserts. Webb *et al.* (1974) stated that oxidized and metallic flavours could develop in ice cream exposed to light intensities similar to those found in merchandizing cabinets or when copper and iron concentrations are relatively high.

Texture of ice cream is directly related to the structure. Structure depends on size, number and arrangement of air cells, ice crystals, lactose crystals and fat clumps. A smooth texture is an indicator of uniform small ice crystals and air cells and no detectable crystals. A snowy texture is observed when large or too many air cells are present. Other texture defects make ice cream gummy, crumbly, curdy, watery and so on, largely due to poor mix formulations (Webb *et al.*, 1974). A substantial decrease (from 7.280 to 6.440) in quality score occurred on storage of the product. Webb *et al.* (1974) stated that the textural defects generally developed during storage, particularly when ice cream was in the retail cabinets and in home freezer chests. Chiefly the fluctuation in the temperature caused the loss of quality.

Decline in overall acceptability scores for ice cream had been reported by Gwiszczynska and Kaluziak (1971). Webb *et al.* (1974) stated that oxidized and metallic flavours could develop in ice cream during storage.

Micro nutrients play a vital role in metabolism. Good quality ice cream should have adequate amounts of important micro elements. The micro elements (Na, K, Ca, Mg and Fe) were analyzed from all ice cream samples. It was found that soy milk blend contain greater amount of Ca and Fe than skim milk (Table 4). Mittal *et al.* (1976) while comparing the analysis of cow milk and soymilk showed that cow milk contained less iron and calcium than soymilk. The results of this study ware similar to the findings of Mittal *et al.*, 1976.

Sensory tests showed that T_2 sample was superior in colour, taste, flavour, texture and overall acceptability than T_4 which obtained lowest score. The reason for gradual reduction in quality of the product from T_2 sample to T_4 could be due to the quantity of skim milk in soymilk used for the preparation of ice cream mix.

It was concluded that soymilk blend can be used for the preparation of frozen desserts especially ice cream. The ice cream prepared from soymilk blend having 20 g soy flour : 80 g skim milk was of good quality in respect of sensory characteristics such as colour, taste, flavour and overall acceptability.

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