Quality assessment of sweetened condensed milk available in Bangladesh

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Abstract

To assess the quality of sweetened condensed milk of Bangladesh, four different brands of sweetened condensed milk were selected viz. Danish, Fresh milk, Star ship and Goalini. Five samples were analyzed for physical (organoleptic), chemical and microbiological qualities. From the physical test, it was observed that all samples were in good grade i.e. fresh, free from odour, viscous and smooth, rich cream to yellow in color and very sweet in taste. The average physical score was 88.20±4.15, 86.20±3.90, 89.20±3.90 and 87.60±5.55 for Danish, Fresh milk, Starship and Goalini, respectively, and these were not differ significantly (p>0.05). Sweetened condensed milk had a titrable acidity of 0.146 to 0.155 % and fat 78.40 to 78.80 (g/kg) that were not significant (p>0.05) for all brand of milk. Whereas significant (p<0.05 to p<0.01) difference was found for protein (g/kg) 75.50±0.02, 67.84±0.23, 78.54±0.07 and 74.04±0.13; ash (g/kg) 15.00±0.07, 16.60±0.06, 17.02±0.04, carbohydrate (g/kg) 550.76±0.30, 544.16±0.69, 553.58±0.034 and 545.70±0.46 and Total solids (g/kg) 720.86±60.60, 706.35±0.53, 727.14±0.52 and 715.84±0.52 for Danish, fresh milk, Starship and Goalini respectively. The total viable count was in the range of 13.60±2.51 and 16.60±2.41(10²/g) and no. coliform bacteria were found. Among the brands no difference was found in physical test, but considering chemical properties star-ship was better than others.

Keywords: Sweetened condensed milk, Physical, Chemical and Microbiological qualities

Introduction

It is well established that milk and milk products are considered to be the most important food item of human beings. Because, they furnish in an exceptionally well balanced combination, easily assimilated fat, carbohydrate, protein, minerals, fluid and vitamins, all of which are essential to the growth and proper nourishment of human being. The United States Department of Agriculture defines sweetened condensed milk as the product resulting from the evaporation of a considerable portion of the water from the milk to which sugar and/or dextrose has been added. It contains not less than 28% of milk total solids (TS) and not less than 8.5% milk fat (Lampert 1970). Whereas in developed countries as well as in many developing countries, sufficient research works have already been done to their respective environments. So, extensive research work in this field is still necessary to know the quality of sweetened condensed milk in the country and to set recommendation for manufacturing quality product. The present study was conducted to evaluate the physical chemical and microbiological qualities of sweetened condensed milk available in the local market and to inform the consumers about the quality of sweetened condensed milk they are consuming from the local markets.

Materials and Methods

The experiment was conducted at the Dairy Technology and Microbiology Laboratory of the Department of Dairy Science and the Fish Nutrition Laboratory of the Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. The samples were collected randomly and in different times of the aforesaid period. Five replications were made for each sample.
The can of the sweetened condensed milk was warmed in water bath at 45°C for 15 minutes and shake. The can was wiped with disinfectant and dried. The surface & the device by which the can was opened also swabbed with ethanol and flamed. Just after opening the total solids (TS) and acidity percentage of the samples were done and recorded and 11 g samples was taken for the preparation of dilution. The remainder was kept under 4°C for further analysis. A total of twenty (4 x 5 =20) samples were analyzed. All the samples were opened aseptically and the following physical, chemical and microbiological tests were carried out.

Just after opening the cans, in each trial were judged to evaluate the flavour, body and texture, colour and taste and thereby the overall of physical score of the samples by a panel of expert judges.

- Determination of per cent acidity
- Determination of total solids (TS) content
- Determination of fat content
- Determination of ash content
- Determination of total viable bacteria count
- Determination of coliform count

Data obtained from samples were analyzed statistically using CRD (Four Treatments & five Replications) with single factor in MSTAT programme. LSD compared the difference among the brands.

**Results and Discussion**

Total physical score of sweetened condensed milk obtained from Danish, Fresh milk, Star ship and Goalini were non significant (p>0.05) (Table 1) It was also observed that there were no significant differences (p>0.05) within the individual score (flavor, body and texture, color and taste) obtained from different sample. The overall physical score (flavor, body and texture, color and taste) of sweetened condensed milk revealed that all were in good grade that was fresh, free from flavors, viscous and smooth; rich cream to yellow in color and very sweet in taste. This result agrees with the finding of Nelson and Trout (1964). Brusentsev and Maslov (1982) who reported that condensing at 50-60°C and sugar syrup added at the end of condensing gave minimum color changes.

**Table 1. Comparison of average score of various physical parameters of different brands of sweetened condensed milk available in the local market**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Brands of sweetened condensed milk</th>
<th>Level of Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Danish</td>
<td>Fresh milk</td>
</tr>
<tr>
<td>Flavour</td>
<td>36.4 ± 2.51</td>
<td>34.80 ± 2.86</td>
</tr>
<tr>
<td>Body and Texture</td>
<td>31.00 ± 2.00</td>
<td>30.80 ± 1.30</td>
</tr>
<tr>
<td>Colour</td>
<td>13.60 ± 1.52</td>
<td>13.00 ± 1.22</td>
</tr>
<tr>
<td>Taste</td>
<td>8.20 ± 1.14</td>
<td>7.60 ± 1.14</td>
</tr>
<tr>
<td>Total</td>
<td>89.20 ± 4.15</td>
<td>86.20 ± 3.90</td>
</tr>
</tbody>
</table>

NS = Non-significant
In this experiment, there were no marked differences observed among the brands of sweetened condensed milk regarding total physical score (flavour, body and texture, colour and taste). Organoloeptic quality of sweetened condensed milk produced by different companies of Bangladesh was quite satisfactory.

The chemical tests were conducted in the laboratory to detect the percentage of acidity, total solids, fat, protein, ash and mixed sugar.

The acidity percentage in sweetened condensed milk obtained from Danish, Fresh milk, Star ship and Goalini were non significant (p>0.05) (Table 2). It was observed that the average value of acidity obtained from fresh milk (0.155±0.01) was higher (p>0.05) and Star ship (0.146±0.01) was lower than the acidity content of other two samples. The results agree with the findings of Mia (1995) who found that the average acidity percentage of sweetened condensed milk was 0.167. Ortin and Algaba (1990) reported that total acidity of condensed whole milk was 0.322.

Table 2. Comparison of average chemical composition and microbiological parameters of different brands of sweetened condensed milk available in the local market

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Danish</th>
<th>Fresh milk</th>
<th>Star ship</th>
<th>Goalini</th>
<th>Level of Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity %</td>
<td>0.148±0.01</td>
<td>0.155±0.01</td>
<td>0.146±0.01</td>
<td>0.153±0.01</td>
<td>NS</td>
</tr>
<tr>
<td>Fat (g/kg)</td>
<td>78.80±0.56</td>
<td>78.40±0.38</td>
<td>78.00±0.28</td>
<td>78.40±0.17</td>
<td>NS</td>
</tr>
<tr>
<td>Protein (g/kg)</td>
<td>75.22±0.22</td>
<td>67.84±0.23</td>
<td>78.50±0.07</td>
<td>74.04±0.13</td>
<td>**</td>
</tr>
<tr>
<td>Ash (g/kg)</td>
<td>16.01±0.07</td>
<td>16.60±0.06</td>
<td>17.02±0.04</td>
<td>17.70±0.04</td>
<td>**</td>
</tr>
<tr>
<td>Carbohydrate (g/kg)</td>
<td>550.76±0.38</td>
<td>544.16±0.69</td>
<td>553.58±0.34</td>
<td>545.70±0.46</td>
<td>*</td>
</tr>
<tr>
<td>Total solids (g/kg)</td>
<td>720.86±0.60</td>
<td>706.35±0.53</td>
<td>727.14±0.52</td>
<td>715.84±0.52</td>
<td>**</td>
</tr>
<tr>
<td>Total viable bac. (10^2/g)</td>
<td>13.60±2.51</td>
<td>16.60±2.41</td>
<td>13.80±1.92</td>
<td>15.20±1.48</td>
<td>NS</td>
</tr>
<tr>
<td>Coliform count/g</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS = Non-significant
** = Significant at 1% level
* = Significant at 5% level

No significant differences (p>0.05) were found among the fat content (Table 2) of sweetened condensed milk. It was observed that average value of fat obtained from Danish was higher (p>0.05) and Star ship was relatively lower than other two samples. According to Komitet Standratov, SSSR (1967) suggested that the fat content for condensed milk would be >8% milk fat.

Protein content of sweetened condensed milk obtained from Danish, Fresh milk, Star ship and Goalini were statistically non significant (p<0.01) (Table 2). It was found that the average value of protein obtained from Star ship 78.5 (g/kg) was significantly higher (p<0.01) and Fresh milk 67.8 (g/kg) was significantly lower than the protein content of other two brands of sweetened condensed milk. Dydenkov (1966) reported the average value of protein content in sweetened condensed milk was 80.4 (g/kg) by Kjeldhal method and 80.3 (g/kg) by Kofranyi method. Luck (1973) reported that the average value of protein in sweetend condensed milk obtained by three methods was 7.87, 8.13 and 7.96% respectively.
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Ash content of sweetened condensed milk from Danish, Fresh milk, Star ship and Goalini were statistically significant (p<0.01) (Table 2). It was observed that the average value of ash obtained from Goalini was significantly higher (p<0.01) and Danish was significantly lower (p<0.01) than the ash content of other two brands. According to Czechoslovakia, Urad pro Normalizacia Mereni (1975) ash content of sweetened condensed milk was 1.9%. Ortin and Algaba (1990) reported that ash content of sweetened condensed milk was 1.82%.

Carbohydrate content of sweetened condensed milk obtained from Danish, Fresh milk, Star ship and Goalini were statistically Significant (p<0.05) (Table 2). It was observed that the average value of carbohydrate obtained from Star ship was significantly higher (p<0.05) and Fresh milk was significantly (p<0.05) lower than other two brands of sweetened condensed milk. The average value of carbohydrate content was 548.5 (g/kg). According to Webb and Johnson (1965) the average carbohydrate content of sweetened condensed milk was 55.7%. Total solids (TS) content of sweetened condensed milk obtained from Danish, Fresh milk, Star ship and Goalini were statistically significant (p<0.01) (Table 2). It was found that the average value of TS obtained from star ship was significantly higher (p<0.01) and Fresh milk was significant lower (p<0.01) than the other two samples. Webb and Johnson (1965) found that the TS content was 73.5%. Brusentsev and Maslov (1982) reported that the TS percentage of sweetened condensed milk was 59.5.60. Korolev and Strakhov (1970) reported that TS content of sweetened condensed milk might be 85.90%.

Statistically no significant differences (p<0.05) were noted within the total viable bacteria count of different brands of sweetened condensed milk (Table 2). It was observed that the average value of total viable bacterial obtained from Fresh milk 16.60 (10^2/g) was higher (p>0.05) and Danish 13.60 (10^2/g) was lower than other two samples. The average value of total viable bacteria count was 14.80 (10^2/g). Ahmed et al. (1988) reported that the average total viable bacteria of sweetened condensed milk was 128 (10^2/g ) and ranged from 300 to 115 (10^2/g). Yankov (1971) reported that after 3 months of storage the initial and final viable count of sweetened condensed milk was 5400-11600 per ml and 1500-9400 per ml. High sugar content appears as self preservatives in sweetened condensed milk as well as increased concentration of milk solids also effective in rising osmotic pressure both are inhibitory to microorganisms (Foster et al., 1957), perhaps these were the main reasons for satisfactory count in present studies.

In this study, there was no evidence of coliform bacteria in any of the samples. Yankov (1967) stated that there were no coliform bacteria in sweetened condensed milk. Czechoslovakia, Urad pro Normalizacia Mereni (1975) reported that sweetened condensed milk of consumer packs type must not contain any coliform bacteria. According to BSTI (2000) coliform count of sweetened condensed milk is nil. The present study agrees with the above results. The results of acidity percentage, fat content, organoleptic tests and microbiological tests indicated that there was no variation among different brands of sweetened condensed milk. But, when other chemical parameters (protein, ash, carbohydrate and total solids) were considered then Star ship was found to be better than that of Danish, Goalini and Fresh milk.

From the standpoint of physical parameters judged by expert panelist, all brands of sweetened condensed milk were in good grade. Chemical analyses and microbiological examinations revealed that all companies were trying to maintain the standard but they were using purified fat. But according to definition sweetened condensed milk should contain milk fat. This implies that there is some thing misperception here. Hence, for many specifications milk fat constant may be studied. Otherwise, The people of the country will always be deceived and deprived of getting quality products.
References


