14

Determination of selected major nutrients in commercially available dairy products in Sri Lanka

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ABSTARCT

Dairy products are available in the Sri Lankan market in different forms such as powdered milk, packaged liquid milk, yoghurt, ice cream, cheese and butter. Quality standards had been specified for most dairy products by the Sri Lanka Standards Institute (SLSI) while some milk products such as packaged liquid milk and milk containing products such as flavored drinks do not have Sri Lankan standards (SLS). However, published data on the major nutrient content of Sri Lankan dairy products is very limited. Therefore, the aim of this study was to determine the major nutrient contents in the dairy products available in Sri Lanka to find their compliance with the SLS.

Results revealed that all major brands of powdered milk contain proteins in the range of 28.8225.62 (±0.02) %, fat in the range of 26.00 - 29.00 (± 0.01) %. All powdered milk samples complied with the SLS. However, content of nutrients were lower in packaged liquid milk when compared with powdered milk on a per serving basis. The nutrient content of protein, fat, calcium and acidity of packaged liquid milk were in the range of 3.660–3.910 (± 0.001) %; 16.00 (± 0.00) %; 0.8671.110 (± 0.175) %; 1.2600 - 1.3300 (± 0.0001) % respectively. The packaged flavored drinks containing milk had even lower content of nutrients. Protein, fat, calcium and acidity of flavored milk were in the range of 3.440 - 3.590 (± 0.001) %; 2.400 - 3.200 (± 0.004) %; 0.080 - 0.119 (± 0.006) %; 0.090 – 0.091 (± 0.000)%. Therefore, one of the important findings of the study is that lesser amount of nutrients are supplied by a

serving of a packaged liquid milk and flavored liquid milk available in Sri Lanka when compared to the powdered milk. Therefore, it would be advantageous to the consumers if the standards are introduced for the packaged liquid milk also. However, it might be difficult to introduce standards for flavored drinks containing milk as they cannot be considered as a true dairy product.

INTRODUCTION

Milk and dairy products contain significant amounts of macronutrients (proteins, lipids and carbohydrates) contributing substantially to daily intake. They also contain minerals and vitamins. These minerals and vitamins, which are quantitatively minor compounds, are not sources of energy but are essential for the life because they contribute to multiple and different vital functions in the organism, like bone structure, homeostasis, muscular contraction, metabolism via the enzymatic systems, etc. Milk fat has the most complex fatty acid composition of the edible fats. The majority of milk fat is in the form of triglycerides formed by the linking of glycerol and fatty acids. The proportions of fatty acids of different lengths determine the melting point of fat and thus the consistency of the butter derived from it. Milk fat contains predominantly short-chain fatty acids (chains of less than eight carbon atoms) built from acetic acid units derived from fermentation in the rumen (Walstra, P. *et al,* 1999).

Milk protein varies considerably among species but as not as much as milk fat. Generally protein percentage is positively correlated with fat percentage. Milk proteins contain more essential amino acids than any other natural food. The main milk proteins are caseins, lactalbumin and lactoglobulin. These proteins constitute more than 90% of the total protein (in cow's milk) and all of them are synthesized in the mammary secretary cell. Milk proteins are found only in milk and nowhere else in nature.

Aim of this project is to determine the major nutrients protein and fat in different types of dairy products available in Sri Lanka. Compliance of the values obtained with the following standards were also done (SLS 181:1983, SLS 824: 1989, SLS 181:1983 and SLS 279:1988). In addition calcium and acidity in some dairy products were also determined.

Powdered milk (7 brands), packaged liquid milk (2 brands), packaged flavored drinks containing milk (5 brands), yoghurt (6 brands), ice cream (3 brands), cheese (5 brands) and butter (2 brands) available in the Sri Lankan market were analyzed. Analysis were carried out in triplicate for each sample.

METHODOLOGY

Fat content was determined according to the AOAC official method 989.05 based on RöseGottlieb method. Milk sample (1.00 g) was added into an Erlenmeyer flask and NH_4OH (1.50 ml) was added to the flask and the solution was mixed thoroughly. Phenolphthalein indicator (2, 3 drops) was added followed by ethyl alcohol (95%, 5.00 ml) and the flask was shaken for 15 seconds. The mixture was extracted with ethyl ether (12.50 ml) and then with petroleum ether (12.50 ml).The ether layer was decanted into a weighed dish. The same extraction procedure was repeated two more times and the ether extracts were combined. Ether was evaporated at <100°C and the weight of the extracted fat was measured.

Protein was determined according to the Kjeldhal method. Protein % in the sample was determined according to the following equation.

% Protein = 6.38 x % N

Determination of acidity in milk powder sample was carried out according to the AOAC Official method 947.05. Milk sample (5.00 g) was

added to a flask and diluted with distilled water (50.0 ml). Phenolphthalein indicator (2.00ml) was added and the mixture was titrated with NaOH(0.1M) until the appearance of first persistent pink colour.

1.00 ml of 0. l M NaOH = 0.0090 g lactic acid

According to the above equation lactic acid content was calculated.

Salt content was determined according to the AOAC Official Method 960.29. The test portion (5.00 g) was placed into an Erlenmeyer flask and swirled with boiling water (80.00 ml). It was allowed to cool to 50-55°C for 5 – 10 min. K_2CrO_4 indicator (2.00 ml) was added and the mixture was titrated with $AgNO_3$ until orange- brown color persists. (Volume of $AgNO_3$ – Volume of Blank) ml x (0.1M) x 0.585) / Weight of Test portion According to the above equation salt content was calculated.

RESULTS

Results revealed that all major brands of powdered milk contain proteins in the range of 28.8225.62 (±0.02) %, fat in the range of 26.00 - 29.00 (± 0.01) %. All powdered milk samples complied with the SLS. However, content of nutrients were lower in packaged liquid milk when compared with powdered milk on a per serving basis. The nutrient content of protein, fat, calcium and acidity of packaged liquid milk were in the range of 3.660–3.910 (± 0.001) %; 16.00 – 16.01 (± 0.00) %; 0.867-1.110 (± 0.175) %; 1.2600 - 1.3300 (± 0.0001) % respectively. The packaged flavored drinks containing milk had even lower content of nutrients. Protein, fat, calcium and acidity of flavored milk were in the range of 3.440 - 3.590 (± 0.001) %; 2.400 - 3.200 (± 0.004) %; 0.080 - 0.119 (± 0.006) %; 0.090 – 0.091 (± 0.000)%. In yoghurt samples protein

and fat contents were in the range of 2.770 - 4.360 (±0.020)%; 3.600 - 3.800 (±0.001)% respectively. The non-fat yoghurt had higher protein content 5.730 (±0.001)% and it has very low fat content.

The protein and fat content of ice cream were in the range of 2.71 - 4.19(±0.02)%; 8.50 -

10.00(±0.01)% respectively. Range of protein, fat and salt content in butter were 0.510 - 0.880 (±0.002)%; 73.00 - 84.50 (±0.03)%;0.190 - 0.250 (±0.006)% respectively. Protein content of cheese slices and cheeses wedges had lower protein content when compared to other brands.

DISSCUSSION

According to SLS standard 731:2008 milk powder should contain 26% (Min) of fat by mass,34 % (Min) protein by mass and titratable acidity 1.5% (Max) by mass and all the powdered milk samples analyzed complied with the standard. One cup of milk prepared using powdered milk would approximately provide 5.57% and 8.6% of the daily requirements of fat and protein respectively.

One of the important finding in the study was that packaged liquid milk and flavored milk available in the Sri Lankan market have low amounts of protein and fat compared to powdered milk on a per serving basis. However, most consumers would assume that the composition of liquid milk would be similar to fresh cow's milk. At present there are no SLS standards for liquid milk and flavored milk. Therefore, it would be advantageous to the consumers if standards are introduced for the liquid milk also. However, it might be difficult to introduce standards for flavored drinks containing milk as they cannot be considered as a true dairy product.

KEY WORDS: Milk, dairy products, nutrients, protein, fat

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