



Analysis of Commercial Milk Samples Present in Pakistani Markets

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Milk is the first choice diet for persons belonging to all age groups. Milk is available in the market in its fresh form and in the packed form. Analysis of packed milks available in Pakistan (Lahore) market was carried for this research work. More than 100 different components have been identified in cow's milk. Most selling brands including Nurpur, Haleeb, Olper's, good milk, milk pack, dairy queen, Gourmet milk were obtained from the market and open raw milk was obtained from milkman. Energy values of the samples were compared on the basis of their fat contents. Similarly smaller will be the chain of fatty acids, greater will be the saponification number. According to this good milk contained greater amount of energy and Gourmet Bakers milk contained lesser amount of energy as it indicated lesser per cent of fats. Similarly Nurpur milk gave smaller amount of saponification number so it contained longer fatty acids chain. The milk sample like Olpher, which contained smaller fatty chain as it contained greater saponification number. Out of these eight milk samples milk pack contains all the nutrition values that meet with the ideal milk to drink. Other milk samples like good milk, Olper's and Nurpur was also quite good and meet nearly with the requirements.

Key Words: Opaque, Electrophoretically, Kjeldahl, Preservatives, Adulterants, etc.

INTRODUCTION

Milk is good for every age of people. It provides the primary source of nutrition for young once and gives 72 % calcium and contains only 9 % of the total calories. Cow milk is recognizing as an excellent source high quality protein. The total amount of protein in milk is 3.4 %^{1,2}. Out total milk protein 80 % is casein 20 % should be of whey protein. Casein, the dominant protein in cow's milk can be fractionated electrophoretically into four major components.

The energy (calorie) contents of milk widely depends on the percentage of fats present in milk, the ideal amount of fats in milk should be 3.7 %^{1,2}. Whole milk contains 3.25 % of milk fat and reduced milk has only 2 %. Milk fat contributes a unique characteristic to the appearance, texture, flavour and suitability of diary food and is a good source of energy, essential fatty acids, fat soluble vitamin and several other potential health promoting components.

Lactose, the principal carbohydrate in milk, is synthesized in mammary glands. Lactose for approximate amount is 54 % of the total solids-not-fat content of milk and contributes about 30 % of the energy of whole milk. Cow's milk contains about 4.85 lactose compared in human milk. Lactose or milk sugar is the principal carbohydrate in human and animal milk. Human milk contains 7 % of lactose, while whole cow's milk contains only 4.8 %³.

The pH value for cow's milk ranging from 6.4 to 6.8, this range is very important if it exceed from it because acidity in milk and low value contains less amount of acidity⁴.

EXPERIMENTAL

The milk samples for this analysis were obtained from local market situated near Lahore. These were stored in refrigerator.

Many experiments were conducted like determination of total moisture and solid contents were determined by Gravimetric method (oven drying method). The temperature kept was about 70-80 °C and placed in oven for 3-4 h. Total solids were calculated as:

$$\text{Total solid \% by weight} = 100 (W_2 - W) / (W_1 - W)$$

Similarly determination of total Ash present in milk sample which was performed by using furnace. The milk samples were taken in preweighted crucible. Charring were done by burning the milk and converted it into blackish material, put them in furnace at 550-600 °C for 5 h. Total ash was calculated as:

$$\text{Ash \%} = \frac{\text{weight before Ashing} - \text{weight after Ashing}}{\text{weight of the sample}}$$

For detection of free fatty acids were conducted by weighted accurately 10 g of each of the milk sample in separate conical flask and melted their fats. Saponification number of the fats is define as the milligram of KOH required to neutralized the

TABLE-1
ANALYSIS RESULTS OF VARIOUS MILK SAMPLES

Sample name	Total moisture (%)	Ash (%)	Fat (%)	Free fatty acids	Sponification number	Protein (%)	Lactose (%)	Ph value	Total acidity
Nurpur	88.2	0.70	3.1	25.33	227.20	3.76	4.0	6.68	0.178
Haleeb	87.2	0.70	3.7	25.61	228.04	3.77	3.8	6.67	0.177
Olper's	88.4	0.72	3.8	25.80	229.168	3.75	4.13	6.68	0.177
Good Milk	80.0	0.70	3.8	26.55	228.888	3.77	4.4	6.66	0.176
Milk Pack	87.4	0.71	3.6	26.28	228.60	4.08	4.0	6.70	0.180
Open raw milk	89.0	0.68	3.6	26.47	228.327	3.40	4.28	6.65	0.181
Dairy Queen	88.2	0.70	3.3	25.11	228.04	3.83	4.13	6.67	0.179
Gourmet milk	90.0	0.71	3.6	25.97	228.888	3.84	4.21	6.66	0.178

fatty acids liberated by hydrolysis of 1 g of fat. Calculations are as:

$$\text{Sponification number} = 56.1 \times \frac{(V_b - V_s)}{W} \times N$$

Kjeldahl method was used for the determination of protein and it depends upon the oxidation of the organic matter with sulphuric acid in the presence of the catalytic and simultaneous formation of ammonia salts and amines from nitrogen in milk. The ammonia and amine may be distilled off when the solution is made alkaline. The distilled was trapped in the standard acid and nitrogen (as ammonia) determination by titration.

Nitrogen % = Titer × Total volume made × Normality of acid × 20 × 100 / Volume taken × weight of the sample × 1000

$$\text{Protein \%} = \text{Nitrogen \%} \times \text{Factor (6.38)}$$

Determination of lactose was taken place by volumetric method. Similarly for pH determination the pH meter was standardized with solutions of pH 4 and 9. To determine the pH of the samples, the electrode was inserted in the samples one by one. Procedure for determination of acidity in milk was well mixed milk samples in separate China dishes.

The total carbohydrates was calculated by:

$$\text{Carbohydrates} = 100 - \text{total Nutritional \%}$$

Similarly the energy was calculated by using formula:

$$\text{Total energy} = (\text{carbohydrates} \times 4) + (\text{protein} \times 4) + (\text{fat} \times 9) = \text{kcal}$$

Other than these many other rapid analysis tests were taken place like Organoleptic test, Preservatives test and Adulterants test.

RESULTS AND DISCUSSION

Nutritional values of different commercial milk samples were examined. These included the detection of total solids (%), moisture (%), ash (%), total protein (%) (non-protein, casein and non-casein), fat (%), lactose, pH and acidity. Other than these many rapid chemical analyses were also observed. In these the tests like neutralizers, preservatives and adulterants, etc. The constituents other than water are known as total solids (T.S.), the % composition of total solids in cow milk is approximately equals to 12.7 % and the moisture that shows the amount of water present in milk is app. equals to 87.3 %.

According to the report, Nurpur milk contained 11.8 % of total solid and 88.2 % of moisture. Haleeb milk contained 12.8 % total solid and 87.2 % moisture. Olpher contained total solid 11.6 % and 88.4 % of moisture. Similarly good milk showed 12 % of total solid and 88 % of moisture; milk pack contained 12.6 % total solid and 87.4 % of moisture, dairy queen and Gourmet milk contained 11.8 % and 10 % of total solids and

88.2 % and 90 % of moisture were present. Open raw milk showed 11 % of total solid and 89 % of Moisture (Table-1).

By the results of all these, it is concluded that milk of Gourmet Bakers contained greater amount of moisture than other milk samples and lesser amount of total solids as compared to all other milk samples under examined.

As the total ash in milk provides us an idea about the mineral contents of the milk. The milk sample that contains 0.7 % of ash is considered to be a good milk to drink. By examining the milk samples under observation, like Nurpur milk, Haleeb, Olpher, good milk, milk pack, Gourmet milk, dairy queen and raw milk, these contained the ash % of 0.70, 0.70, 0.72, 0.70, 0.71, 0.70, 0.71 and 0.68 %, respectively. Those values of ash % indicated that all of the milk samples contained approximately the same amount of ash other than the open raw milk, which contained lesser amount of minerals as compared to other milk samples under examination. Greater will be the amount of ash present in milk, greater will be the amount of minerals present.

Milk fat is unique among animal fats, because it contains a relatively high proportion of short-chain and medium-chain saturated fatty acids (*i.e.*, those with 4 to 12 carbons in length). Milk fatty chain of the fatty acids, to neutralize these fats KOH is required and the process is called sponification number.

Milk samples under investigation showed the fat % of Nurpur milk 3.1 % and 227.20 of sponification number. Haleeb milk contained 3.7 % of fats and sponification number 228.04. Olpher contained 3.8 % of fats and 229.168 of sponification number. Good milk and milk pack showed 3.8 and 3.9 % of fats and 228.888 and 228.60 of sponification number. Similarly dairy queen and Gourmet milk contained fats of 3.3 and 3.6 %, sponification number of 228.04 and 228.888. Open raw milk indicated 3.6 % of fats and 22.327 of sponification number.

Greater will be the % of fats, greater will be the samples contains the energy. Similarly smaller will be the chain of fatty acids, greater will be the sponification number. According to this Good milk contained greater amount of energy and Gourmet Bakers milk contained lesser amount of energy as it indicated lesser % of fats. Similarly Nurpur milk gave smaller amount of sponification number so it contained longer fatty acids chain. The milk sample like Olpher which contained smaller fatty chain as it contained greater sponification number.

Cow's milk is recognized as an excellent source of high-quality protein. Cow's milk protein is a heterogeneous mixture of proteins. Milk also contains small amounts of various enzymes and traces of non-protein nitrogenous materials. Of

the total protein in cow's milk, about 80 % is casein and 20 % is whey protein.

The samples of the milk that were under examination indicates the variation in the total protein % in Nurpur milk contained 3.76 % of total protein, Haleeb milk showed 3.77 %, 3.75 % of total protein were present in Olpher, 3.77 % in good milk and 4.08 % of total protein were present in Milk pack. Similarly dairy queen contained 3.83 % and Gournmet milk contained 3.84 % of total protein. Open raw milk showed 3.40 % of total protein present in it.

According to these analyses it indicated that open raw milk contained lesser % of total protein so it contains lesser amount of energy in it. pH and acidity of the milk plays vital role, amount of the acidity present in milk shows the % of lactic acid present in it. The value of pH that referred to be present in milk is 6.6-6.7. All the milk samples under investigation showed that those were in the range acidity have contained little amount of acidity also present in them.

Lactose, the principal carbohydrate in milk, is synthesized in the mammary gland. Lactose is a disaccharide. Made up of equal portion soft two monosaccharides; glucose and galactose. Milk samples of Nurpur, Haleeb, Olpher, good milk, milk pack, dairy queen, Gournmet milk and open raw milk all showed the amount of lactose 4.0, 3.8, 4.13, 4.4, 4.0, 4.13, 4.21 and 4.28. All those samples indicated the amount of lactose nearly equals to the reference amount of lactose present in good milk for drink. Milk contains lactose is good but if it contains an enzyme to digest.

Milk can be considered as fine quality, if it is safe and clean, free from objectable odour and flavour and meeting reasonable constant food values. Hence rapid methods of milk has be carried out for routine check up and ensuring the purity of milk.

Milk that contains high amount of acidity shows clot on boiling. Olpher and Gournmet milk showed high amount of acidity as they formed clots on boiling, other milk samples showed the +ve results. That also indicated the amount of acidity in milk other milk samples showed lesser amount of acidity in milk than those three samples that gave +ve response and were able to drink.

Neutralizers are chemical substances that are alkaline in nature. They are added in milk in order to regulate the acidity in milk. This includes rosolic acid test, neutralizer and alkalinity test. Milk samples under examination showed the absence of sodium, potassium and calcium hydroxide in rosolic acid test. In case neutralizers test milk samples like Nurpur, Haleeb, Olpher and good milk showed very fine ppt's that indicated the added neutralizers in milk samples and were suitable to drink other than those milk pack, dairy queen, Gournmet milk and raw milk indicated the absence of neutralizers.

Preservatives in milk inhibit the development of micro-organisms and thus preserve the milk for longer. Various preservatives are added in milk like formalin, hydrogen peroxide, nitrates, etc., Samples like Haleeb milk, good milk and Gournmet milk contained Formalin in them that indicated those were to be preserved for long time, others showed the -ve results. Similarly milk sample like Haleeb, milk pack and dairy queen contained hydrogen peroxide in them. So according to these analyses we can say that Haleeb, good milk, milk pack, dairy queen and Gournmet milk contained the preservatives and can be perseveres for long time (Fig. 1).

Adulterants like cane sugar, urea, glucose, sodium chloride, starch etc. are generally added to milk by adulterators to raise the SNF of milk. Urea, starch, maltodextrin and sugar all were absent in the milk samples those were under investi-

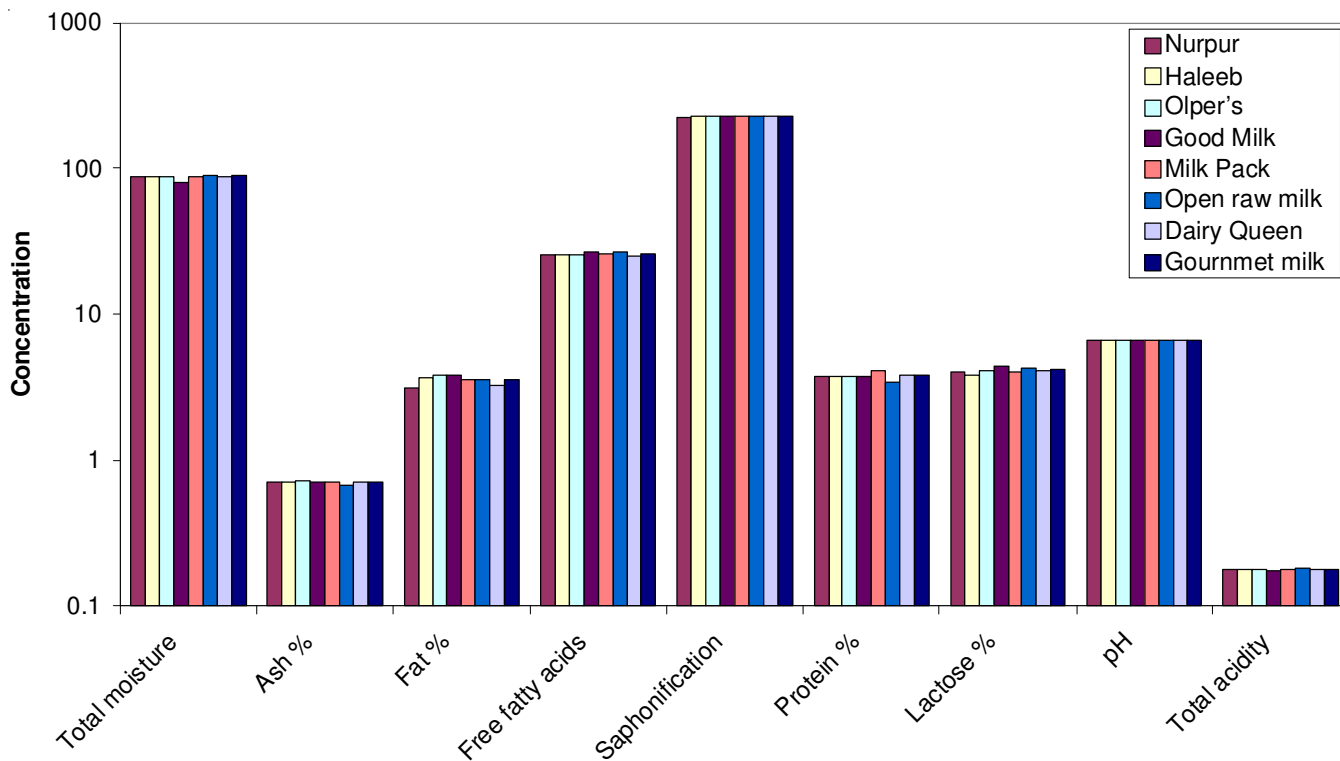


Fig. 1. Analysis of different milk contents

gation. Milk samples of Nurpur, Olpher, milk pack, dairy queen, Gournmet milk and open raw milk all indicated the presence of hypochlorite in them as it raised the SNF in milk.

Other than these all the milk samples gave -ve results of presence of pulverized soap, detergents and presence of pond water in them. All the milk samples contained salt in them and showed the absence of caramel. Beside that the important factor is that the milk should be boiled properly but according to these analyses it has been indicated that none of the milk sample was boiled properly at 80 °C.

Conclusion

All the nutritional values of the commercially available milk samples were conducted. Selected commercial milk samples (Nurpur, Haleeb, Olpher, good milk, milk pack, dairy queen, Gournmet milk and open raw milk) were taken as task. A number of analysis on these milk samples have been carried out including Moisture test, fats, Ash, total protein (casein, non-casein, non-protein), lactose in milk, pH and acidity in milk, other than these some rapid chemical tests were taken place. By all these we can be able to distinguish between the different commercial milk samples that which one is better than other one.

According to the scale, we can give the rank by this analysis as milk pack is at 1st position as it contains 12.6 % total solids, 87.4 % moisture %, 0.71 % of ash, 3.6 % of fats and 4.08 % of the total proteins. These all values are nearly equals to the ideal nutritional values for milk, other milk samples are also ranked according to their nutritional values.

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