COMPARATIVE STUDY OF SKIMMED MILK POWDER, BABY MILK POWDER & DIARY WHITENER USING NEAR INFRA RED SPECTROSCOPY

Dr. Ranjeet Kaur

Associate Professor,

Guru Nanak Khalsa College, Matunga, Mumbai400019

Abstract: In Indian culture milk is given special emphasis during all phases of life. Milk and milk products are important part of Indian balanced diet. Both rural and urban population use milk in their everyday food habits as it has important constituents which are required for health. Due to rapid urbanisation milk powder market has grown in leaps and bounds. However, due to the ever-increasing demand and because of various brands in the market, adulteration of milk products is a great matter of concern. There is a need for the rapid analysis of the milk products especially the nutritional parameters. The variability of the milk products properties comes from the raw material, the different drying methods and the numerous chemical reactions that could happen during storage because of the temperature, relative humidity, and time. The quality of milk powder or diary whitener is directly related to its composition and nutritional parameters.

In the present study Near InfraRed (NIR) spectroscopy , a non-destructive analytical technique was used to comparatively analyse some of the nutritional parameters of commercial milk powder brands available in Mumbai

Key words: Milk powder, brands, nutritional parameter, Near Infra Red Spectroscopy

Introduction: Milk is an extremely perishable product and yet it could be preserved for later consumption by removing water by means of drying methods to prevent the growth of microorganisms and inhibit enzymatic reactions.

The main purpose of manufacture of milk powder and its various forms is to convert the liquid in the milk to a product that can be stored without substantial loss of quality owing to a low water content that slows microbial metabolism. Milk powder is the cheapest source of milk solids to be used in bakeries, infant formulas, nutritional foods, manufacturers. Both full cream and skimmed milk powder are used[1].

Moreover, milk powders are frequently used for convenience in transportation, handling, processing, and product formulations but they are highly susceptible to various changes such as moisture uptake, softening, browning, compaction, collapse or caking[2].

The basic quality indicators of milk powders are both their chemical composition and their physical properties (particle size, density, flowability, solubility, water activity, etc.). The variability of the milk powders properties

comes from the raw material, the different drying methods and the numerous chemical reactions that could happen during storage because of the temperature, relative humidity, and time.

Milk powder manufacturers use worldwide many resources to ensure products with good sensory quality and longer shelf life. Despite the raw milk standardization, the carefully defined technological parameters and the rigorous quality assurance procedures adopted in the production plants, some unacceptable variations may remain between different batches of milk powder. The measurement of these parameters by means of well-defined test methods is important because they intrinsically affect the powder behaviour.[3]

Moisture: All milk powder must meet a requirement for residual moisture. The moisture content will have an influence on the keeping quality of the powder. High moisture content will decrease the keeping quality, as the proteins will denature and the lactose, which is found in an amorphous stage, will crystallize causing the free fat to increase in whole milk powders, and oxidation of the fat will be the result. The Maillard reaction, which is a reaction between the NH_2 group in the amino acid lysine, and lactose, becomes more pronounced, and the powder may even become brown and lumpy. The Maillard reaction is directly proportional to the storage time, temperature, and residual moisture content. The packing material should be of such a quality that very little vapour will penetrate the bag or container.

Total Fat: The determination of the fat content in milk is essential in quality control for determining the nutritional content, detecting fraudulent adulterations that can modify the organoleptic properties and even alter the health of consumers.

Proteins: Milk is a good source of proteins. Proteins are required for muscle growth, bone strength, immunity amongst other benefits.

Lactose: Lactose is source of carbohydrates and slow-release energy in the body.

Near InfraRed (NIR) spectroscopy is a non-destructive analytical technique that utilizes the NIR region of the electromagnetic spectrum (690 to 2600 nm). This technique involves the interaction of NIR radiation with molecular vibrations within a sample resulting in characteristic absorption bands[4].

Near InfraRed area of the electromagnetic spectrum has the best combination of attributes for the analysis of most solid, slurry and liquid samples. Light in this region interacts with OH, NH and CH bonds and certain wavelengths (frequencies) are associated with each bond type. When NIR light is presented to samples high in chemical compounds containing these bonds, some of energy is absorbed by the sample in these specific wavelengths, and thus the reflected light has less intensity in these regions[5].

Aim and Objective: In the present study of international and local brands of milk powder and its various forms available in the market were compared for their Moisture, Protein, Fat and Lactose content using Near InfraRed (NIR) spectroscopy analyser.

Materials and Methods: Milk powder, Baby milk powder and diary whitener of various brands were purchased from the local market for the comparison of their Moisture, Protein, Fat and Lactose parameters. The Unity Scientific SpectraStar XT-R near-infrared (NIR) analyzer was used to compare some of the nutritional parameters.

Results and Discussion: The following observations were recorded for the various samples which were collected.

SAMPLE NAME	MOISTURE (%)	PROTEIN (%)	FAT (%)	LACTOSE (%)
Amul Skimmed Milk Powder	3.631	36.105	0.459	52.449
Chitale Skimmed Milk Powder	5.429	36.277	0.843	50.426
Nestle Baby Milk Powder	3.451	18.122	19.049	55.476
Amul Baby Milk Powder	3.645	24.859	18.66	48.202
Krishna Baby Milk powder	3.521	20.650	18.567	49.227
Britania Dairy whitener	2.236	22.593	17.075	53.581
Society Dairy whitener	4.702	24.418	13.319	53.425
Nestle Dairy whitener	2.961	25.601	5.432	62.201
Krishna Dairy whitener	4.085	31.565	0.778	57.502

As seen from the results in the category of skimmed milk powder moisture was more in local brand as compared to the international brand. High moisture content may be because of poor packaging which might lead to poor quality of the product as time passes. Protein and fat content were in the same range whereas lactose was more in Amul brand as compared to local brand.

In Baby milk powder category although the moisture content was almost the same for all the brands, however, Nestle had low protein content compared to Amul and local brand however its and fat and lactose were high as compared to other two brands. Amul and the local brand Krishna were having fat and lactose values which were comparable to each other however Amul had more protein content as compared to the local brand.

In the Diary whitener category Society and the local brand had high moisture content as compared to Britannia and Nestle. While the protein content of the Local brand was the highest followed by Nestle. Britannia had the least protein content. In terms of fat Britannia had the highest fat content followed by Society. The local brand

had the least fat content. In terms of Lactose Nestle had the highest lactose content followed by the local brand. Britannia and Society had comparable values.

Conclusion: In the present study of the comparative analysis between the commercial international brands and the local brands the nutritional parameters (moisture, protein, fat and lactose) were found to be comparable. Adulterants have made their way into our food system. Since milk and milk products are an important part of our diet. Hence their nutritional parameters cannot be compromised. To keep adulteration in check a quick and reliable analytical technique is required. Near infrared (NIR) analyser offers reliable and accurate results, rapid analysis, no sample preparation, no hazardous chemicals used leading to greener approach towards analysis and on - site portability.

Conflict of interest: The author declares there is no conflict of interest regarding this paper.

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