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Sensory evaluation of various skim milk and whole milk powders in Kashmir division

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Abstract

The current investigation was undertaken with the aim to evaluate the quality of milk powders in Kashmir Valley for characterizing its sensory attributes. The sensory evaluation of various milk powders was carried out by the trained and semi trained panel. The panelists evaluated the samples of milk powders for various attributes viz., flavor, physical appearance and package. The results revealed that sensory attributes of milk powder collected from three zones were found to be of approved quality, irrespective of the brand and class and values were found to be within acceptable limits.

Keywords: Sensory, evaluation, skim milk, milk powders

Introduction

Milk is a highly nutritious food that serves as an excellent growth medium for a wide range of microorganisms (Rajagopal *et al.*, 2005) [7]. Converting milk into milk powder increases its shelf life and enables it to be stored for extended period (about 1 year) without substantial loss of quality even at ambient temperatures. The dairy-based powders are not only used for recombination or reconstitution, but they can be exploited for their intrinsic functional properties for application as a food ingredient in several “value-added foods” such as confectionery, bakery, and meat products (Sharma *et al.*, 2012) [8]. Dried milk powder must exhibit high quality in sensory, nutritional and microbiological attributes at the time of purchase (Hough *et al.*, 2002) [5] as the consumer uses the milk powder in hot beverages, frozen desserts, cheese, yoghurt, bakery products, soaps and baby food items (Liod *et al.*, 2005) [6].

Milk powders are frequently used for convenience during transportation, handling, processing, and product formulations but they are highly susceptible to various changes such as moisture uptake, softening, browning, compaction and collapse or caking. The basic quality indicators of milk powders are both their chemical composition and their physical properties (particle size, density, flowability, solubility, water activity, etc.). Milk powder manufacturers use worldwide many resources to ensure products with good sensory quality and to be having longer shelf life. Skim milk powder (SMP) can have a maximum shelf life of about three years, while whole milk powder (WMP) can have a maximum shelf life of six months which could be extendable to one year in presence of packaging under inert gas like Nitrogen. It helps in reducing cost of transportation and storage. It mitigates, to a remarkable extent, the regional and seasonal imbalances, thereby help providing this extremely salubrious food to the regions which are deficient in milk. It serves as an excellent tool for the fortification of the staple food, thereby helping in eliminating the problems arising out of nutritional deficiencies. The method of preserving food stuffs by drying them and thereby depriving microorganism of the water necessary for their growth, has been known for centuries. According to Marco Polo's accounts of his travels in Asia, Mongolians produced milk powder by drying milk in the sun. The first modern production process for dried milk was invented by the Russian doctor Krichevsky. The first commercial production of dried milk was organized by the Russian chemist M. Drichoff in 1832. In 1855, T.S. Grimwade took a patent on a dried milk procedure, though William Newton had patented a vacuum drying process as early as 1837.

According to recent report published by FAO in March, 2019, world SMP exports reached to 2.6 million tonnes. Imports sharply expanded in China, Mexico, Egypt and Indonesia. A recently released report by IMARC (International Market Analysis Research and Consulting Group), titled "Skimmed Milk Powder Market in India, critically examined the Indian skimmed milk powder market. They reported that the market exhibited a CAGR of 9% during 2010-2017.

The healthy growth of the market can be attributed to numerous forces. The market is primarily being driven by growing health consciousness among the consumers. The powdered milk consumed in the Kashmir valley is totally imported and the product quality is seldom ascertained, therefore the apprehensions about the quality of the product remains a genuine concern to consumers that needs to be addressed. In order to address this genuine concern, the powdered milk products need to be tested for their conformity with the legally laid down standards with the aim of ascertaining their suitability for use by the consumers.

Materials and Methods

Sampling

To find out the sensory evaluation of various milk powder samples in Kashmir Valley, a survey of various households and commercials was conducted. A purposive sampling plan was followed in which, the valley was divided into three zones: North, South, and Central. Further, from each zone one district was selected randomly and from each district four blocks were selected (randomly).

Analysis of samples

The milk powder samples were analysed for the quality parameters given below.

Reconstitution of milk powder

10 g of skim milk or 13 g of whole milk powder was weighed, it was made up to 100 ml with warm distilled water at 24 °C. Contents were stirred for 90 seconds. The sample was allowed to stand until the foam settled. The period of standing after mixing did not exceed 15 minutes (FSSAI, 2012).

Sensory evaluation

The sensory evaluation of various milk powder samples was carried out by a trained and semi-trained experienced panel consisting of scientists of LPT division and PG students of F.V.Sc. & A.H, SKUAST-K. The panelists evaluated the samples of milk powder for various sensory attributes *viz.*, flavour, physical appearance and package according to the score sheet presented by BIS: 10030-1980.

Statistical analysis

The data was averaged and the results so generated were analyzed statistically by ANOVA using SPSS software.

Results and Discussion

The data pertaining to various sensory characteristics of SMP is presented in Table-1. Analysis of variance revealed that there was no significant difference ($p > 0.05$) amongst various zones studied so far the attributes like physical appearance and package are concerned. Further the package was invariably awarded full scores. It would be apparent from the data presented in the table that there existed significant variation in flavour scores of Skim milk powder as revealed by ANOVA. South zone differed significantly as compared to north and central zones under study in that it had significantly

higher scores ($p \leq 0.05$), the latter however did not differ significantly within themselves ($p \geq 0.05$).

Table 1: Sensory characteristics of milk powder (SMP) collected from various zones of Kashmir valley

Parameters	Zones			Overall mean
	Central	South	North	
Flavour	9.51±0.05 ^a	9.74±0.04 ^b	9.49±0.08 ^a	9.58±0.03
Physical appearance	4.84±0.03 ^a	4.81±0.03 ^a	4.80±0.06 ^a	4.81±0.01
Package	10.00±0.00	10.00±0.00	10.00±0.00	10.00±0.00

Means ± SE, row wise with different superscripts, differ significantly ($p \leq 0.05$)

The data pertaining to various sensory characteristics of WMP is presented in Table-2. Analysis of variance revealed that there was no significant difference amongst various zones studied as far as the attributes like physical appearance and packages are concerned. Further the packages were awarded full scores. It would be apparent from the data presented in the table that there elicited significant variations in flavour scores of WMP as revealed by ANOVA in that the central zone possessed significantly higher ($p < 0.05$) scores than either north or south Zone samples, the latter two, however, were found to be comparable, albeit the samples from north zone showed numerical superiority compared to south zones.

Table 2: Sensory characteristics of milk powder (WMP) collected from various zones of Kashmir valley

Parameters	Zones			Overall mean
	Central	South	North	
Flavour	9.71±0.05 ^b	9.39±0.08 ^a	9.51±0.05 ^a	9.53±0.03
Physical appearance	4.62±0.04 ^a	4.61±0.06 ^a	4.64±0.04 ^a	4.62±0.01
Package	10.00±0.00	10.00±0.00	10.00±0.00	10.00±0.00

Means±SE, row wise with different superscripts, differ significantly ($p \leq 0.05$)

As discovered from the results, the flavour showed significant difference in the south zone, from north and central zone in case of SMP. Highest scores for flavor in SMP were seen in South zone compared to Central and North and in case of WMP significant difference was seen between central zone and the other two zones. Highest scores for flavor in WMP were seen in central zone followed by north and south in descending order. The overall mean values of 9.58 and 9.53, for SMP and WMP respectively were observed. No significant differences ($p \geq 0.05$) amongst various zones studied were observed so far as the attributes like physical appearance and package are concerned. The results were in agreement with the Abdalla *et al.*, 2019^[1] who made a study on the sensory evaluation of non-fat dry milk/skim milk powder and found variations in the flavor. Further, as is apparent from the results, packaging was invariably awarded full scores. All the evaluated powder samples met the Indian standard grade requirement for sensory characteristics, however, there were significant differences among flavor in various zones. It may be suggested that differences noted between samples could have arisen presumably due to variability in processing conditions.

Conclusion

The sensory evaluation of skim milk powder revealed no significant difference amongst various zones studied so far the attributes like physical appearance and package are concerned. Further the package was invariably awarded full scores. There existed significant variation in flavour scores of

Skim milk powder as revealed by ANOVA. South zone differed significantly as compared to north and central zones, the latter however did not differ significantly within themselves. Analysis of variance revealed that there was no significant difference amongst various zones studied as far as the physical appearance and package of whole milk powder are concerned. Further the packages were awarded full scores. Significant variations in flavour scores of whole milk powder showed that Central zone possessed significantly higher ($p \leq 0.05$) scores than either North or South Zone samples. It was concluded that sensory attributes of milk powder were within acceptable limits by and large.

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