

# Camel Milk Powder: A Novel Introduction to Indian Dairy Sector

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## ABSTRACT

Camel milk is a relative newcomer to both Indian and as well to international milk markets. The recent processing technology emergence has coincided with a variety of processed products based on technology established for milk from other dairy animals. Technical improvements, on the other hand, have to be tailored to functional food products with a distinct behavior and composition. Camel milk powder can provide a great opportunity to dairy industries for introducing new products to the market of milk and milk products. This article gives a brief review regarding camel milk powder development technology, limitations and challenges to overcome.

## INTRODUCTION

Camel milk is popular in many countries because of its reputed health benefits. In 2018, global camel milk output totaled 31.371 million tonnes, with India contributing 7.959 million tonnes, with an average yearly productivity of 179.5 kg per year [1]. The Food Safety and Standards Authority of India has issued a legal requirement for camel milk in India, requiring a minimum 2 percent milk fat and a minimum 6 percent solids not fat, stressing the product's commercialization potential [2]. Camel milk production has gotten a lot of attention recently, and it's vital for developing countries' economic development.

According to Camel milk includes significant levels of immune-active proteins such as lysozyme, lactoferrin, immunoglobulins, lactoperoxidase, vitamin C and insulin all of which are important in disease defense mechanisms [3]. Camel milk, like any other milk, is highly perishable, with losses occurring on the farm, in the informal market, and in the legal market. Poor hygienic procedures and issues in milk preservation caused by the inability to turn

camel milk into shelf-stable goods have been linked to these losses. Camel milk may have anti-diabetic, anti-cancer, autism prevention, and non-allergenic properties. When compared to bovine milk, it has more minerals (Ca, Fe, Mg, Cu, Zn, and K), vitamins (A, B2, E, and C), antibacterial proteins (lactoferrin, lysozyme, immunoglobulins), and lower fat and cholesterol [4].

### Camel milk powder

Camel milk and camel milk powder are relatively new products at international dairy market, appreciations to the advent of powder milk manufacturing, which is the best way to preserve this perishable product (camel milk) for later use. Furthermore, camel milk is frequently produced in remote locations distant from the consumption basin, and the only method to convey a large amount of milk is to remove the water it contains (88-90% of the weight). Another benefit of this method is that the nutritional value of liquid milk is preserved. Spray-drying and lyophilization (freeze-drying) are the two main current drying technologies used to create camel milk powder.

## SPRAY DRYING TECHNOLOGY

Spray drying is the most frequent commercial process for drying milk, and making milk powder from camel milk can produce a more stable product with a longer shelf life. During spray drying, the short time of heat contact and high rate of evaporation result in the manufacture of a high-quality product at a low cost used a two-step process to compare the physical properties of powdered camel and cow milk obtained by spraying in a study comparing the physical properties of powdered camel and cow milk obtained by spraying [5]. Milk was first concentrated to 20-30 % dry matter using a rotating evaporator at 80°C, and then passed through a sprayer for drying. The equipment (FT80/81 Tall Form Spray Dryer) allows modest amounts to be treated with the same effects as a large-scale sprayer. The drying conditions in their protocol were as follows: air intake temperature of 200-220°C, air outlet temperature of 98-105°C, pump speed of 3-5 arbitrary units, and air outlet humidity of 1.2 percent to 5.8%. The study concluded that this procedure allows them to obtain powder with less than 1.8 percent water (moisture), allowing for a lengthy shelf life. The drying temperature should be carefully managed, as too high a temperature causes protein denaturation, which increases the insolubility index of dried powder. Camel milk powder has a lesser solubility than cow milk in general. Fluidity is another parameter used by producers to determine the quality of milk powder. This is the ratio of the density of the uncompacted powder to the density of the compacted powder. Camel milk looks to have less fluidity than cow milk, although it still has a reasonable level of fluidity.

### Freeze drying technology

Freeze drying technique was used to analyze the thermal characteristics of camel milk and its principal components in the first recorded trial aiming at creating camel milk powder [6]. These tests, however, were conducted in a laboratory (rather than on an industrial scale) using a freeze-dryer that allowed drying at temperatures ranging from -40 to 20°C under a vacuum of 100 pounds per square inch. At 11.3 percent humidity, the produced powder was stable. Aimed to investigate the influence of freeze drying on the nutritional qualities of camel milk, specifically how the technique affects the fine composition of camel milk when compared to fresh milk [7]. Analyses revealed that most components (including minerals and vitamins) were very stable, indicating that the nutritional characteristics of camel milk powder were preserved. This was accomplished, however, with laboratory equipment with limited capabilities. Furthermore, there was no any data mention of the powder's solubility.

## DISCUSSION

Although the spray-drying process appears to be advantageous for making camel milk powder since it allows for better liquid milk reconstitution, the investment for the dairy sector is more crucial because it necessitates the purchase of costly milk drying tower and sprayer. The biggest constraint, however, is that drying uses a lot of energy. Despite recent technical developments and unique equipment, the spray-drying process in the dairy industry has a greater energy requirement per tonne of final product. Furthermore, a huge cost is required to set up milk powder developing unit. It's also clear that spraying camel milk necessitates optimizing the input parameters (temperature, pressure, and flow) in order to retain the product's nutritional properties as well as the powder's functional characteristics/features (solubility, hygroscopy, and fluidity).

### Decreasing camel population

It is believed that demand for camel milk is increasing, while the camel population is declining at an alarming rate on the other due to industrialization in developing countries. The only way to save the camel is to find new applications for it and milk may be one of them due to its medicinal and nutritional benefits. The *Bikaneri*, *Jaisalmeri*, and *Kachchhi* breeds in India produce  $4.19 \pm 0.11$  kg,  $3.72 \pm 0.17$  kg and  $3.94 \pm 0.13$  kg of milk, respectively [8]. The figures indicate that there is enough room for the species' milk production capacity to be improved. The focus of camel breeding may now move to improving milk production potential, which could help to save the species while also giving nutritional and financial support to camel keepers. Many camel breeders claim that the animals aren't well suited to machine milking and that selective breeding is required to increase milk production and make milking easier.

### Development of camel milk powder

Denaturation of proteins (particularly whey proteins) is the main issue with camel milk during high-temperature heat treatment, as occurs during spray drying, which explains the difficulty in obtaining UHT milk. The surface composition of powder milk is critical for maintaining the optimum possible conditions and facilitating the solubility of the powder to replenish the liquid milk [9]. The spray-dried emulsion's surface is made up primarily of fat (largely triglycerides), with some proteins thrown in for good measure. As a result, high-temperature denaturation of serum proteins increases the fatty surface content of the powder, making it difficult to replenish liquid milk. It is suggested that "encapsulation" utilizing sodium caseinates be performed during this rebuilding to improve the emulsion and ensure the powder's stability. The inclusion of lactose improves this encapsulation. When lactose is present in a 1:1 ratio to sodium caseinate, for example, surface fat is reduced from 30% to less than 5%.

### Customer preference and consumption

Camel milk failed to attract attention due to a lack of knowledge about its health benefits. Camel milk has a lot of health benefits that most of people aren't aware of. As a result, raising consumer awareness is critical since consumers will not purchase a product if they have never heard of it. Camels, like all mammals, produce milk only after giving birth, and their pregnancies last for 13 months. This can add to the length of time it takes to complete a project. Demand is outstripping availability in areas where camel milk is gaining popularity, ultimately increasing the price of the products. Camel milk has long been a part of many Eastern civilizations' diets, although it is just recently becoming a commercialized culinary trend in Western societies. Many people believe that humans do not

require the milk of other mammals and that doing so exploits these creatures, such as cows, goats, and camels. As a result of ethical considerations, some people shun camel milk and other animal-based milk.

## CONCLUSION

Camel milk powder is relatively new product in the dairy market, but due to its nutritive values and health benefits it can be a great asset to society. The development of camel milk powder at industrial scale is in its early stage. There are some constraints such as availability of camel milk, camel farming, customer preference and commercialization. However, despite these constraints the global as well as Indian camel milk market is strongly changing with customers accepting various new products from camel milk. The reason behind the change is increasing awareness of health benefits through camel milk.

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