



Nutritional Properties of Camel Milk –A Review

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Abstract

Camel milk is known for its unique properties and many nomadic and pastoral cultures were consuming it since the beginning of their domestication. In recent times, the popularity of camel milk is constantly increasing because of its health beneficial substances, making it somewhat different from cow milk. These substances include insulin, vitamins, minerals, bioactive peptides, polyunsaturated fatty acids, lactoferrin, lysozymes and peptidoglycan recognition protein (PGRP) making it suitable for use in various health related issues of humans including autism, diabetes, gastro-intestinal disturbances, cow milk allergy, jaundice, T.B., dropsy, Crohn's disease and anaemia.

Keywords: Camel, lactoferrin, lysozymes, autism, PGRP

Camel is known as the "ship of desert" because of their ability to survive without water for many days and adaptability in dry conditions. In India, Camel is the state animal of Rajasthan. Besides Rajasthan, camels are also found in states like Gujarat, Haryana and some parts of Uttar Pradesh. Every year, international camel festival is organized in Bikaner in the month of January. Based on utility, camel is classified as Riding Camels and Baggage Camels. Common camel breeds are: Bikaneri, Jaisalmeri, Jalore, Kutchi, Malvi, Mewati, and Kharai. Bikaneri camel breed is the principle camel breed which is very majestic, heavy, masculine and mainly employed for baggage purposes. The famous Usta Art of Bikaner which is the art of Golden painting is embossed on this breed's back. Jaisalmeri camel breed is thin, lean with light brown colored body and is employed for riding purposes.

Camel rearing societies are commonly known as "Raikas" or "Rebaris". Camel milk has considerable socio-economic value in many arid and semi-arid areas. Average camel milk yield is 3-5 litres /day and the average lactation length of camel milk is 14-18 months.

Physical Properties of Camel milk

- Color - opaque white
- Odour - normal
- Taste - slightly saline
- Acidity = 0.12-0.16
- pH= 6.5-6.7 (average = 6.63)
- Hard to curdle and to prepare ghee

However, the composition of camel milk is variable. It depends upon breed type, nutrition plain, lactation stage and many others.

Table 1: Gross % composition of milk from various species

S.No.	Species	Moisture (%)	Fat (%)	Lactose (%)	Protein (%)	Ash (%)
1.	Camel	88-90	2.60-3.20 (minimum)	3.3-5.8 (5.1) maximum	3.7-3.8	0.6-1.0 (0.9)
2.	Cow	86-88	3.7-4.4	4.8-4.9	3.2-3.8	0.7-0.8
3.	Goat	87-88	4.0-4.5	3.6-4.2	2.9-3.7	0.8-0.9
4.	Sheep	79-82	6.9-8.6	4.3-4.7	5.6-6.7	0.9-1.0
5.	Human	88-88.4	3.3-4.7	6.8-6.9	1.1-1.3	0.2-0.3

Moisture content and protein content is more in camel milk as compared to cow milk. Whereas, fat content and total solids are more in cow milk as compared to camel milk. The vitamin C content of

camel milk is 10.5 %. vitamin C content of camel milk is responsible for its low pH and hence, stabilizes the milk and can be kept for longer durations. Unprocessed /raw camel milk can be stored for 5 days at 7°C whereas, pasteurized camel milk can be stored for at least 22 days (3 weeks) at 7°C.

In modern times, due to several health promoting properties of camel milk, its increased consumption is gaining attention especially in foreign countries. The positive health effects of milk proteins can be presented as antioxidative, antibacterial, anti-microbial, anti-hypertensive, anti-thrombotic and immuno-modulatory action.

Camel milk is high in insulin content and immunoglobulins. Camel milk is rich in vitamins (A, B-2, E and C) and minerals (sodium, potassium, iron, copper, zinc and magnesium).

Compositional Characteristics of Camel milk

Camel milk is known for its unique contents that are not found in milk of other animal species. Following contents are present in camel milk-

- 1. Milk proteins-** In dromedary camel milk, protein content is 3.73-33.89 %. However, protein content in camel milk varies according to season i.e. low in summer and high in winter.
- A. Casein Protein-** Casein is found in milk only. Molecular weight of casein protein is more in camel milk as compared to cow milk. The casein particle diameter range in camel milk is 20-300 nm whereas in cow milk, it is 40-160 nm.
- B. Whey Proteins-** whey protein in camel milk is slightly more than cow milk.
- 2. Fats-** Fat content in camel milk is 2.60-3.20 %. But, if the camel is thirsty for a long time, its fat content reduced from upto 1.1 %.
- 3. Fatty acids** -Camel milk has high proportion of long chain fatty acids i.e. 96.4 % whereas, in cow milk, it is 85.3 %. As compared to cow milk, camel milk has lesser concentration of short chain fatty acids and has lesser carotene.
- 4. Lactose-** Lactose is the major carbohydrate fraction in milk and is a source of energy for the young calf. Lactose content in camel milk i.e. 3 to 5.8 % is relatively constant throughout the lactation.
- 5. Mineral Content-** Total ash in camel milk is 0.60-0.90 %. Salts in camel milk are mainly chlorides, phosphates and citrates of sodium, calcium and magnesium. Also, different breeds of camel have different capacities to deposit minerals in their milk. Trace minerals viz. iron, zinc, copper are more in camel milk than cow milk.
- 6. Vitamins-** Numerous vitamins are found in camel milk viz. vitamin A, C, E, D and B groups. However, vitamin A, B1, B2, E, folic acid and pantothenic acid are lesser than cow milk. Vitamin C concentration in camel milk is 34.16 mg/L, which is 3 to 5 times more than cow milk. β -carotene is not detected in camel milk. The level of vitamin A, E and B1 are higher in camel colostrums as compared to mature camel milk
- 7. Camel Milk Protective Proteins-** Milk Protective Proteins enhance immune defense system. Milk protective proteins in camel milk are: Immunoglobulins, Lactoferrin, Lysozyme and Lactoperoxidase.

Lactoferrin content of camel milk (0.22 mg/mL⁻¹) is higher than goat, sheep, buffalo and cow milk. Lysozyme content of camel milk (228-500 μ g/100 mL) is higher than cow milk (13-37 μ g/100 mL). There is no antigenic resemblance between bovine and camel milk lysozyme, indicating alike structures. Major function of lysozyme in milk is the protection of the udder against infections caused by microbes. Lactoperoxidase present in camel milk is a monomeric protein, which shows about 79.2 % sequence likeness to human eosinophil peroxidase and 79.3 % sequence likeness to human myeloperoxidase. Peptidoglycan Recognition Protein (PGRP) has been detected in camel milk but not present in cow milk. PGRP has broad spectrum antimicrobial activity and it has the ability to control metastasis.

Health promoting and Medicinal properties of camel milk:

Camel milk is supposed to have nutritive as well as medicinal properties. Milk is frequently used in infant feeding, as an alternative cow milk allergy, gastrointestinal complaints, diabetes and several other diseases.

- For infant feeding, camel milk has more digestibility and less allergic reactions in infants. Camel milk powder dissolves better than cow's milk powder. (dissolvability index 74% and 63% respectively).
- As an alternative source to cow 's milk allergy- β -lactoglobulin and beta-casein protein are responsible for cow milk allergies. Like human milk camel milk does not contain β -lactoglobulin. Camel milk also contains beta-casein, but the structure of this protein in camel milk is very different. Camel milk contains a number of immunoglobulins that are compatible with human ones.
- Camel milk is used for the treatment of food allergies and Autism.

- For GI complaints, camel milk is hypoallergenic with inflammation-inhibiting constituents.
- For Type I Diabetes, Camel milk also has an inflammation-inhibiting effect on the β cells of the pancreas. Camel milk has insulin like activity, regulatory and immunomodulatory functions on β cells. In colostrum, higher levels of insulin in camel milk is present than in cow milk. Camel milk exhibits hypoglycemic effect, which might be due to presence of insulin/insulin like protein.
- As an immuno-modulator, camel milk has high zinc concentration which in turn, plays role in the development and maintenance of a normally functioning immune system
- In various diseases, Camel milk protein has Antibacterial and antiviral activities. Camel milk lysozyme showed a higher lysis value towards *Salmonella typhimurium*. Camel milk has been used in the treatment of disorders like dropsy, jaundice, anaemia, piles, T.B., cow milk allergy and asthma.

Conclusion

In conclusion, the consumption of camel milk is increasing day by day due to its uniqueness and potential health benefits. Camel milk is an excellent, natural and easily available option for infants, autistic and diabetic patients.

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