

**Supporting the
Development of Camel-
Milk Derived Products**

*Why a Proposed Codex Standard on
Camel Milk Products?
Scientific Rationale*

Tuesday 26 November 2024

Dr. Amine Kassouf

Research Manager - GFoRSS

Outline



Introduction



Production and trade of
Camel Milk Products



Compositional
specificities of Camel
Milk



Economic Value of Camel
Milk Products



Conclusion

Introduction

International Year of Camelids (IYC 2024)

- Declared by the United Nations to highlight the overlooked potential of camelids.
- Aims to raise awareness and encourage investment in the camelid sector.

Camel's Potential in Food Production

- Key source of milk and meat in arid and semi-arid areas.
- Significant contribution to food security, economic growth, and poverty alleviation.

Growing Demand for Camel Milk Products

- Increasing demand beyond traditional regions (Africa, Asia, Near East).
- Exports now reaching European and North American markets.

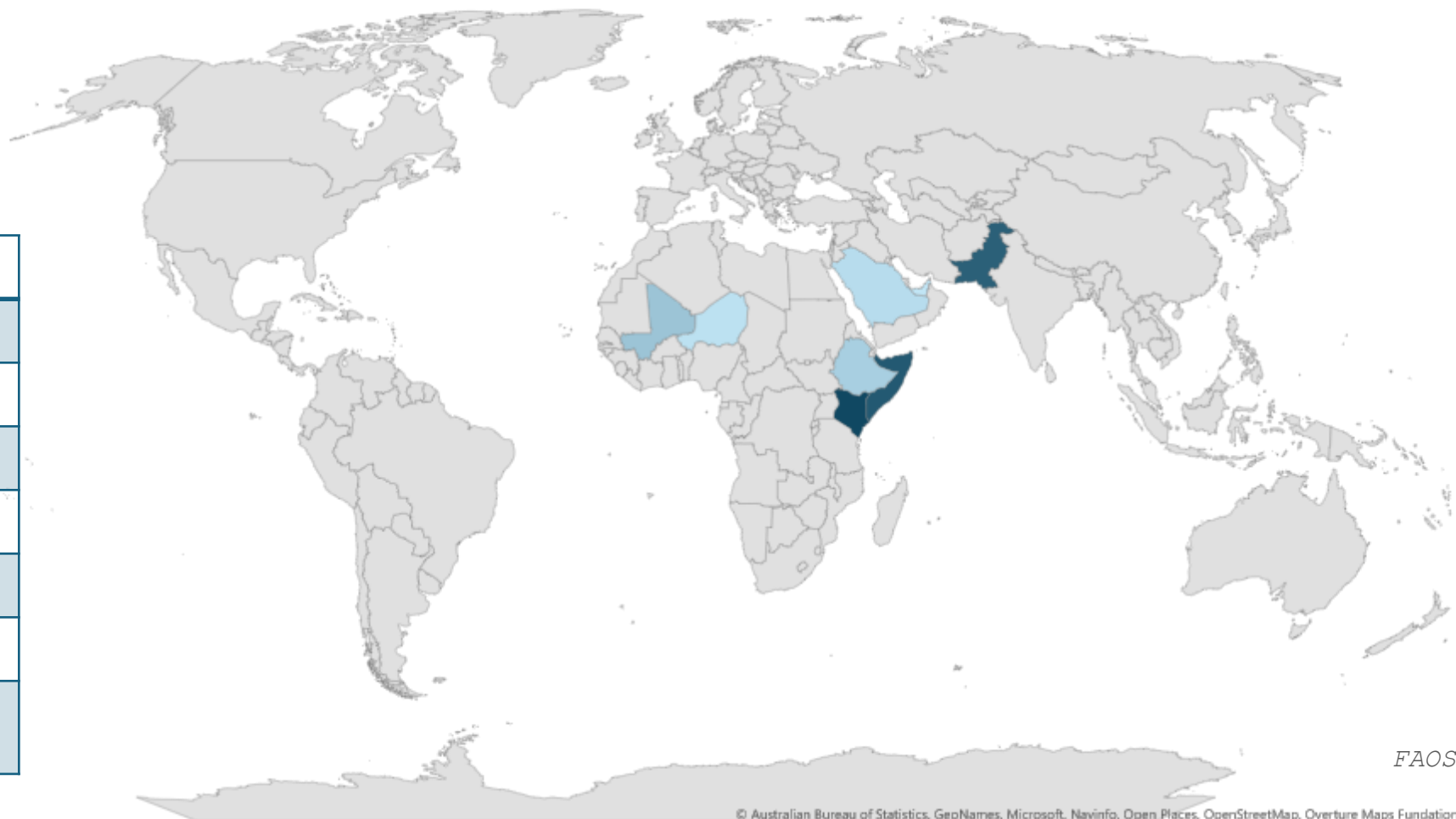
Challenges to Supply Chain Integrity

Unique composition and trade opportunities drive



Production of Raw Camel Milk

Production (tons)



Kenya
Somalia
Pakistan
Mali
Ethiopia
Saudi Arabia
Niger
United Arab Emirates

FAOSTAT, 2022

Powered by Bing

© Australian Bureau of Statistics, GeoNames, Microsoft, Navinfo, Open Places, OpenStreetMap, Overture Maps Foundation, TomTom, Zenrin

Trade of Camel Milk Products

Dominance of Informal Trade

- The Camel Milk sector is largely informal in terms of both volume and stakeholder involvement.

Consumer Preferences & Awareness

- Preference for unprocessed milk due to cultural reasons.
- Limited awareness among non-traditional consumers restricting market expansion.

Camel Milk Trade Insights (Kenya Example)

- Kenya produces 26% of the global Camel Milk supply.
- Only 12% of production is traded (10% sold to rural consumers and 2% sold to urban markets).
- 88% consumed locally, with significant post-production losses due to inadequate collection and transport infrastructure.

Alweya et al. (2013). The acceptability of camel milk and milk products from North-eastern province in some urban areas of Kenya

Trade of Camel Milk Products

Camel Milk Products produced and traded

- Pasteurized Camel Milk
- Condensed UHT Camel Milk
- Traditional Fermented Camel Milk
- Dried Fermented Camel Milk Product
- Camel Milk Butter
- Camel Milk Cheese
- Camel Milk Yoghurt
- Camel Milk Powder
- Camel Milk Ice Cream
- Dried Milk Chocolate



Camel Milk Powder is the most produced and traded internationally

Distinct Characteristics of Camel Milk: Nutritional Value

□ The general composition of Camel Milk varies depending upon the region, breed, season, and lactation stage.

□ The primary compositional characteristics of Camel Milk pertain to its **protein, fat, lactose, minerals,** and **vitamin** content profiles,

which are quite different compared to bovine and caprine milk!



Distinct Characteristics of Camel Milk: Proteins

The composition of protein fractions of camel milk is quite different from that of bovine milk both in terms of quantity and types of protein fractions.

Camel Milk contains:

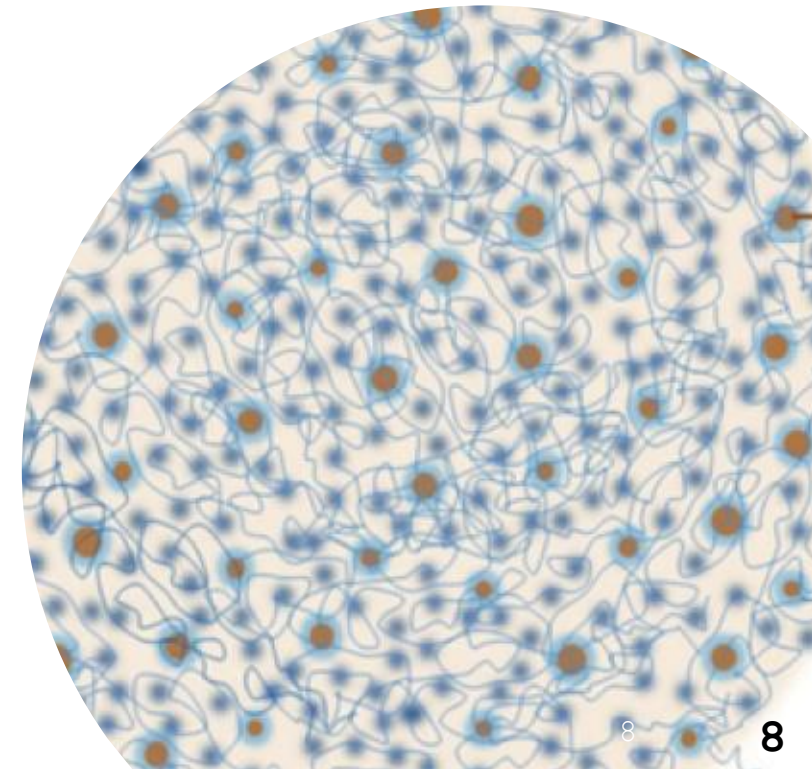
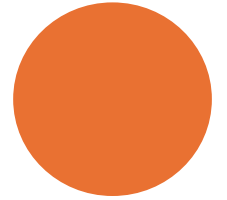
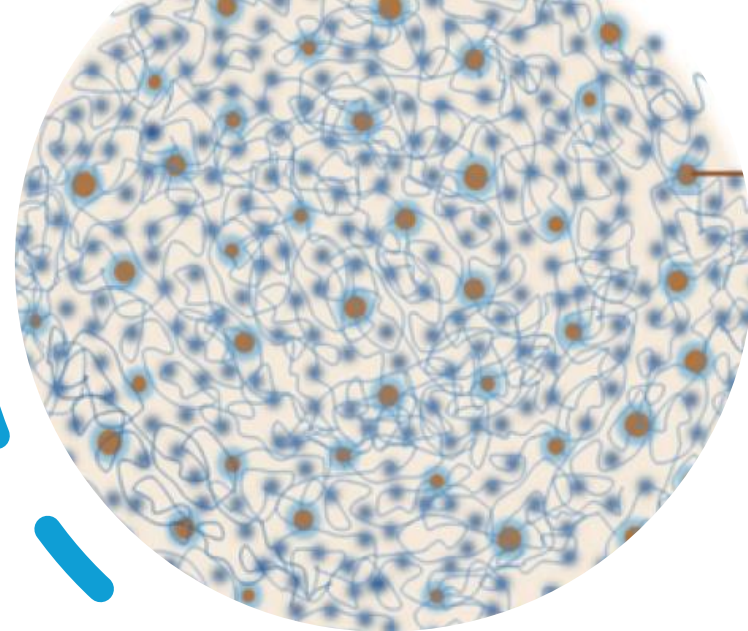
- high percentage of β -casein, like **what is found in goat and human milk**, contributing to easier digestibility.
- low proportion of κ -casein.
- higher casein micelle diameter

β -lactoglobulin, the major whey protein and one of the major allergenic compounds in bovine milk, is absent in camel milk!

This specific protein profile of camel milk can have technological implications:

- Rheological properties of yoghurt: weak gel structure and thin consistency

Poor coagulation and difficulties to make fermented dairy products such as cheese and yoghurt.



Distinct Characteristics of Camel

Camel milk can have fat contents ranging from 2 to 6%.

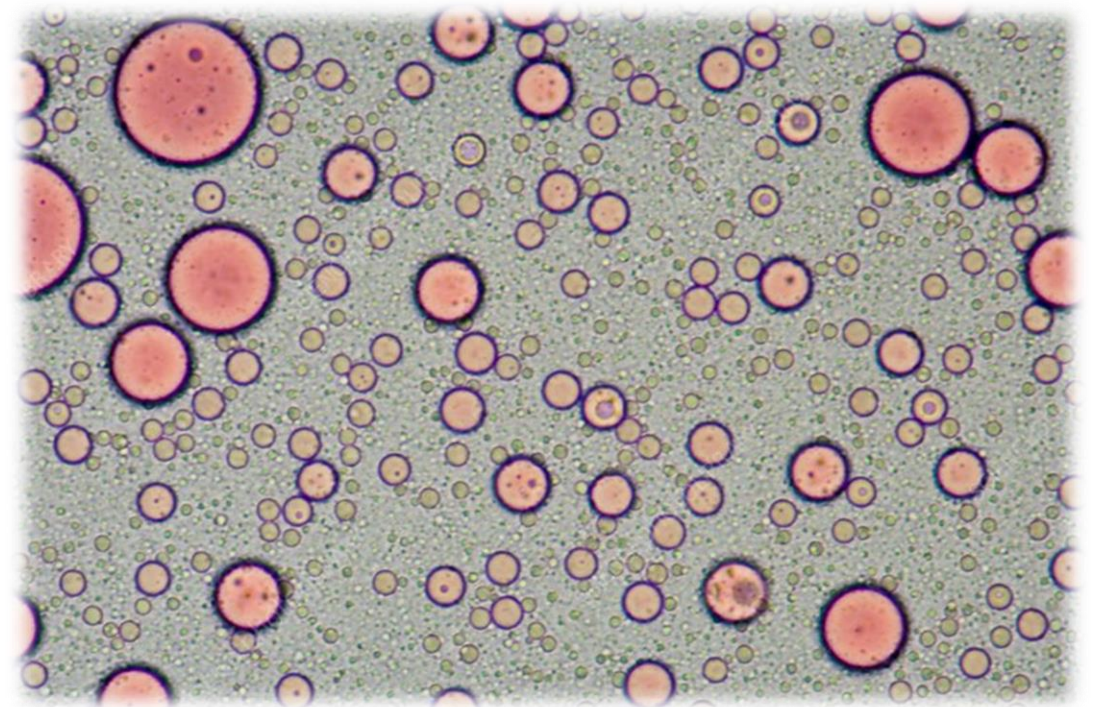
The average fat globules size of camel milk is smaller than that of other mammalian milk:

- High digestibility of the fat,
 - Difficulty in butter making and low butter fat recovery.
-

Camel milk fat is characterized by higher proportion of unsaturated fatty acids compared with milk of other species.

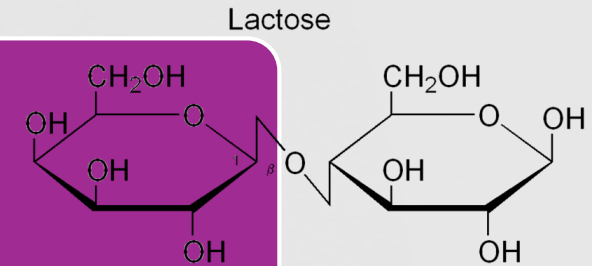
Higher contents of long-chain fatty acids (C14-C18), particularly palmitoleic acid (C16:1), were also reported for camel milk fat compared with bovine and caprine milk fat.

The fat in camel milk is largely similar to breast milk (potential use as breast milk substitute).

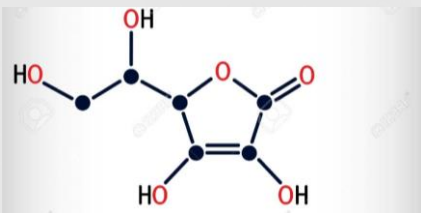


Distinct Characteristics of Camel Milk: Lactose, minerals and vitamins

Camel milk contains comparable lactose concentration to cow milk. However, unlike cow milk, people who are lactose-intolerant can consume camel milk with less difficulty (lower concentration of caseomorphin, which would cause lactose to become more exposed to the action of lactase by slowing down intestinal motility).



Ash content in Camel Milk is similar to that in bovine milk, but much higher than in human milk (Ca, Mg, P, Na, K, Cl⁻, Cu, Zn, Fe, Mn, Se). It is noteworthy to mention that iron (Fe) concentration in Camel Milk was reported to be six times higher than in bovine milk.



Camel Milk is renowned for its high vitamin C content, which is reported to be three to five times greater than that of bovine milk.

Economic Value of Camel Milk Products

High Economic Value:

- Limited supply and specialized farming conditions.
- High labor, handling, processing, and distribution costs.
- Increasingly recognized health benefits.

Expanding Market:

- Niche market with consistent growth in Europe, the U.S., Africa, and the Middle East.

Adulteration Concerns:

- Documented cases of Camel Milk powder adulterated with bovine milk powder at export markets.
- Adulterated products used in various formulations, threatening product integrity.

Conclusion

Variation in Composition

- Influenced by species differences and diverse geographic areas.
- General trends in key macronutrient levels can be established for standardization purposes.

Unique Features of Camel Milk

- Higher β -casein content
- Absence of β -lactoglobulin, a major allergen found in bovine milk.
- Closest dairy commodity to human milk, where β -lactoglobulin is also absent.

Key Implications

- Enables specific identification and distinction from adulterated products.
- Highly sought after by consumers due to nutritional and allergenic benefits.

Vulnerability to Adulteration

- Susceptible to dilution and substitution with bovine milk.

Standardization Potential

- Unique characteristics make Camel Milk products amenable to global standardization and support authenticity determination.

References

- Ho, T. M., Zou, Z., & Bansal, N. (2022). Camel milk: A review of its nutritional value, heat stability, and potential food products. *Food Research International*, 153, 110870. <https://doi.org/10.1016/j.foodres.2021.110870>
- Liu, C., Liu, L.-X., Yang, J., & Liu, Y.-G. (2023). Exploration and analysis of the composition and mechanism of efficacy of camel milk. *Food Bioscience*, 53, 102564. <https://doi.org/10.1016/j.fbio.2023.102564>
- Muthukumaran, M. S., Mudgil, P., Baba, W. N., Ayoub, M. A., & Maqsood, S. (2023). A comprehensive review on health benefits, nutritional composition and processed products of camel milk. *Food Reviews International*, 39(6), 3080–3116. <https://doi.org/10.1080/87559129.2021.2008953>
- Seifu, E. (2023). Camel milk products: innovations, limitations and opportunities. *Food Production, Processing and Nutrition*, 5(1), 15. <https://doi.org/10.1186/s43014-023-00130-7>



