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Camel milk in the horn of Africa: Production systems, physicochemical, and nutritional quality, traditional utilisation, safety, and market value chain dynamics

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Abstract

Camel production plays a crucial role in supporting the livelihoods and food security of pastoral and agro-pastoral communities across Ethiopia, Kenya, Somalia, and Djibouti in the Horn of Africa. This review systematically synthesizes peer-reviewed studies and regional reports published between 2000 and 2026, identified through structured database searches and screened using defined inclusion criteria, to evaluate camel milk production systems, traditional utilisation, physicochemical and nutritional quality, safety, and value chain dynamics across the region. Camel milk is widely consumed raw or fermented and serves as a key dietary resource. Traditional practices across the region involve spontaneous fermentation for product formation, the production of sour milk products and camel milk tea, and the incorporation of camel milk into various local dishes; however, systematic documentation of these practices remains limited. Compared with bovine and caprine milk, camel milk generally contains lower fat and lactose levels, higher vitamin C and mineral concentrations, and distinct protein characteristics, including lower -casein content and the absence of -lactoglobulin, which influence digestibility and processing properties. Reported fat content ranges from approximately 2.5 to 4.5 % and protein from 2.5 to 3.9 %, while vitamin C levels substantially exceed those of bovine milk. These features confer nutritional advantages but also create technological challenges, such as weak coagulation and extended fermentation time. Despite increasing urban and cross-border demand, the sector remains constrained by feed shortages, limited veterinary services, inadequate processing facilities, informal marketing systems, and hygiene limitations that contribute to microbial contamination. Key gaps include a lack of harmonised quality standards, limited comparative data on milk composition and microbiological safety, weak cold-chain infrastructure, and poor value-chain coordination. Furthermore, climate variability and recurrent droughts continue to exacerbate production challenges in pastoral systems. Strengthened hygiene, standardised quality protocols, improved processing and cold-chain systems, and coordinated institutional support are essential to enhance commercialisation, safety, and regional integration.

Keywords: Camel milk production, Horn of Africa, milk safety and quality, traditional utilisation, value chain

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