

Traditional Consumption, Therapeutic Value and Its Derived Dairy Products of Dromedary Camel (*Camelus Dromedaries*) Milk in Somali Regional State, Eastern Ethiopia; A Review

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Abstract

A comprehensive review on dromedary camel milk traditional consumption, therapeutic value and its derived dairy product in Somali Regional State, Eastern Ethiopia is reviewed. In the pastoral community manufacturing of derived dairy products still difficulties in our country. Problems associated with derived dairy product produced from camel milk are highlighted. Fresh and fermented camel milk products were found to provide various potential health benefits. Include a treatment for gastritis, asthmatics, stomach discomfort, HIV, hamot (kar), tuberculosis, fever, urinary problems, hepatitis, jaundice, common cold, dearbeh ("diarrhea"), daarta ("nausea") and diabetics, for corresponding diseases there are traditional ways of treatment and for some diseases even dosages were present in Somali Regional State, Eastern Ethiopia.

Keywords: Dairy Products, traditional consumption, therapeutic value

Introduction

According to the recent statistics by the Food and Agriculture Organization (FAO), the total population of camels in the world is estimated to be about 20 million, with Somalia having the largest herd worldwide (FAO, 2008). Camels live in the vast pastoral areas in Africa and Asia and divided into two different species belonging to the genus *Camelus*. Dromedary camels (*Camelus dromedaries*, one humped) that mainly live in the desert areas (arid), and Bactrian camel (*Camelus bactrianus*, two-humped) which prefer living in the cooler areas. The Bactrian species is domesticated in the East to the Northern China and in the West to Asia Minor and Southern Russia, including Mongolia and Kazakhstan (Farah, 1996; Yagil, 1982). On the other hand, the dromedary species widely occurs in the Middle East, North and East Africa, South West Asia and Australia. The total population of the dromedary species (domestic) worldwide is estimated to be about 15 million head (Mukasa-Mugerwa, 1981) and Ethiopia possesses over 2.4 million dromedary camels that stand the country third in Africa in camel population (FAO, 2010). The majority of camels in the country are found in the drier areas of the Eastern part of the country and kept, among other things mainly for milk production in these areas. The annual camel milk production in Ethiopia is estimated 75,000 tones (Felleke, 2003). They produce milk for quite longer period even during dry periods compared to cattle (Kurtu, 2003). Camel milk is popular in Saudi Arabia and consumed as fresh and soured milk (Abu-Taraboush, Al-Dagal, & Al-Royli, 1996). Traditionally milk produced from camels is primarily used for direct consumption in raw state or fluid milk by the majority of pastoralists and some of consumed in the form of Dhanaan as fermented milk, in the form of tea and an ingredient for eating porage, soups, kinchie and pasta in Somali Regional State (Eyassu, 2007; Zeleke *et al.*, 2007).

The milk composition of dromedary camel is excellent from a nutritional view point (Gran *et al.*, 1991). Camel milk also has valuable nutritional properties as it contains a high proportion of antibacterial substances and higher concentration of vitamin C in comparison with cow milk. (Barłowska *et al.*, 2011, Agrawal *et al.*, 2005) have reported a unique camel milk health benefit in different patients. Camel milk is much more nutritious than that of cow milk because it is low in fat and lactose contents, and higher in potassium, iron and vitamin C, (Farah, 1993) Camel milk has medicinal properties and contains protective proteins, which may have a possible role for enhancing the immune defense mechanism (Abu-Taraboush, 1996).

Camel milk has an important role in human nutrition in the hot regions and arid countries. This milk contains all the essential nutrients found in bovine milk (El-Agamy, Abou-Shloue, & Abdel- Kader, 1998; Karue, 1998). Fresh and fermented camel milks have been used in different regions in the world including India, Russia and Sudan as a treatment for a series of diseases such as dropsy, jaundice, tuberculosis, asthma and leishmaniasis or kala-azar (Abdelgadir, Ahmed, & Dirar, 1998; Shalash, 1984). Recently, camel milk was also reported to have other potential therapeutic properties, such as anti-carcinogenic (Magjeed, 2005), anti-diabetic (Agrawal, Budania, Sharma, Gupta, & Kochar, 2007a), and anti-hypertensive (Quan & Miyamoto, 2008), and has been recommended to be consumed by children who are allergic to bovine milk (El-Agamy, Nawar, Shamsia, Awad, & Haenlein, 2009). Fresh and fermented dromedary camel milk in Eastern Ethiopia, Somali Regional State to

provide a potential treatment for a series of diseases such as Jaundice, Malaria, Constipation, to clear the stomach, post partum care of women, to detoxify snake venom, gastritis, asthmatics, stomach discomfort, HIV, *hamot (kar)*, tuberculosis, fever, urinary problems and hepatitis. and flatulence (Eyassu, 2007; Zeleke *et al.*, 2007). Moreover, camel urine was also reported to be used as a treatment for diarrhea (Al-Attas, 2008).

Dairy products like butter, cheese and other are not common in majority of the pastoral community and few of them indicated that it is difficult to extract the fat and it takes long time (2-3 days) to churn the milk, it is possible to make butter from camel milk (Eyassu, 2007; Aleme *et al.*, 2013). Camel milk has not been given as much attention in research compared with bovine milk. Most of the research conducted on camels in the past was mainly focused on their anatomical and physiological features (Farah & Farah-Riesen, 1985). However, the recent studies have mainly concentrated on the compositional, characteristics and functionality of camel milk. The aim of this paper is to review the currently available information on dromedary camel milk traditional consumption, therapeutic value and its derived dairy products in Somali regional state, eastern Ethiopia.

2. Traditional consumption of dromedary camel milk

In Eastern Ethiopia in particular in Jigjiga and Shinile zones camel milk is mainly consumed in its raw state without being subjected to any sort of processing treatment (Eyassu, 2007). Yagil (1982) reported that camel milk is consumed fresh in most camel rearing societies. Consumption of raw camel milk should be of major concern from public health point of view. They mix camel milk with milk of cows, goats and sheep particularly when intended to make products such as butter and cheese (Eyassu, 2007).

In Jigjiga and Shinile zones pastoralists produce naturally fermented sour milk called *Dhanaan*. *Dhanaan* (also called *Karuur*) is made by placing fresh camel milk in a clean/smoked container, wrapping the container with a piece of cloth and keeping it in a warm (ambient temperature) place for about 12-24h to allow spontaneous fermentation (Eyassu, 2007). *Dhanaan* is made by spontaneous fermentation without using a starter culture and sometimes small amount of previously fermented milk is added as a starter into fresh camel milk it takes only 6h to obtain *dhanaan* (Eyassu, 2007). Kenyan researchers showed that the quality of *susac*, fermented camel milk, improved using selected mesophilic lactic starter cultures rather than spontaneous fermentation; the resulting fermented milk had a uniform taste and a longer shelf life (Farah *et al.*, 1990; Laley, 2005).

3. Therapeutic value of dromedary camel milk

For a long time, milk was considered to only provide nutritional components such as essential amino acids (Hambræus, 1992). In the last decades, several studies have shown that milk is an important nutritional and functional source and could provide particular health benefits due to the presence of bioactive substances in milk. Fresh and fermented dromedary camel milk have been acknowledged for a long time in different parts of the world to provide a potential treatment for a series of diseases such as dropsy, jaundice, tuberculosis, asthma, and leishmaniasis or kala-azar (Abdelgadir *et al.*, 1998; Shalash, 1984). These potential health benefits are obtained through a number of bioactive components in camel milk. These components were reported to exist naturally in camel milk (Agrawal *et al.*, 2007a; El-Agamy, 2007); or derived from camel milk proteins using probiotic strains (Elayan *et al.*, 2008; Quan *et al.*, 2008).

One peculiar characteristic of camel milk is its therapeutic value against a number of human diseases. In Eastern Ethiopia, particularly in Jigjiga and Shinile Zones Pastoralists claim that camel milk is used to treat a number of illnesses in human beings (Eyassu, 2007). Fresh and fermented dromedary camel milk in Ethiopia to provide a potential treatment for a series of diseases such as Jaundice, Malaria, Constipation, to clear the stomach, post partum care of women, to detoxify snake venom and flatulence (Eyassu, 2007). Camel milk is mainly in eastern Ethiopia in Jigjiga and Shinile Zones used to treat jaundice, malaria and constipation. According to the pastoralists view, the claimed therapeutic property of camel milk is attributed to the fact that camels browse on various plant species and active agents with therapeutic properties from these plant species are secreted into the milk of camels (Eyassu, 2007).

Pastoralists have indigenous knowledge in treating their animals and themselves. Due to the fact that they are living at periphery and very remote area where social services are in scarce or even absence, pastoralists depend on traditional remedies. Camel milk, meat and urine are among the materials used as traditional medicines in Babilie and Kebribeyah, recognize the medicinal value of camel milk (Zeleke *et al.*, 2007). Yagil (1982), Knoes *et al.* (1986), Tezera (1998) and Alemayehu (2001) who stated that in all camel rearing countries, the breeders are convinced that camel milk has special medicinal properties, especially for dropsy, jaundice and conditions affecting the lungs and spleen. Research conducted in Babilie woreda indicated the medicinal value of camel milk for a treatment of gastritis, asthmatics, stomach discomfort, HIV, *hamot (kar)*, tuberculosis, fever, urinary problems and hepatitis. On the other hand research conducted in Kebribeyah indicated the medicinal value of camel milk for jaundice, common cold, *dearbeh* ("diarrhea"), *daarta* ("nausea") and diabetics, for corresponding

diseases there are traditional ways of treatment and for some diseases even dosages were indicated (Zelege *et al.*, 2007). Yagil (1994) and Konuspayeva and Faye (2004) who reported the medicinal value of camel milk for cirrhosis of the liver, rickets, constipation, asthma and anemia.

3. Derived dairy products of camel milk

3.1. Butter

In Eastern Ethiopia, in Jigjiga and Shinile zones majority of the pastoralist reported that butter cannot be made from camel milk. On the other hand, few of them indicated that it is difficult to extract the fat and it takes long time (2-3 days) to churn the milk, it is possible to make butter from camel milk. Butter can be made from camel milk by placing fresh camel milk in a container made of goat skin and by hitching it to the saddle of the camel during long journey. During this time, the milk in the container gets churned and eventually small black butter grains are formed. The butter made as such is not consumed as butter per se rather it is mixed with fresh camel milk and drunk (Eyassu, 2007).

Some authors describe butter being made from camel milk alone, blending it with goat, cow milk (Asresie *et al.*, 2013; Shalash, 1984; Tesfamariam *et al.*, 2012) while others categorically state that butter cannot be made from camel milk (Davies *et al.*, 1980). The preparation of butter from camel milk is not as easy as from milk of other animals owing to its unique milk-fat properties. The fat is distributed as small micelle-like globules in the milk (Davies *et al.*, 1980; Yagil and Etzion, 1980). In addition, the fat is apparently bound to protein and there is a great difference in fatty acid composition. (Gassem, 2007). Knoess observed that butter can be obtained after 15 to 20 minutes churning, whereas according to (Shalash, 1984) it can take up to about four hours. Butter can be made by churning fresh camel milk at 24–25°C in a special blender (Abdelgadir *et al.*, 1989). At lower temperatures the cream of the camel milk will not churn. In the Sahara, butter is made by placing camel milk into a thin, hairless, goat-skin for 12 hours. This skin is never washed with water. Inside the temperature rises to 28°C, a temperature very similar to that used in the blender (Abdelgadir *et al.*, 1989). In winter the goat-skin is often placed into the ground near a warm fire to obtain the optimum temperature before making butter. This aids in the fermentation. Churning is done when the container is half filled with sour milk. Air is blown into the container and the top is tied off. It is hung on a tent pole and rapidly swung to and fro. This is done in the early morning and the amount of butter obtained is determined by the skill of the man doing the churning. No churning is done during the day as solar heat apparently impedes proper separation. Optimization of churning and cream separation processes help alleviate the difficulty of buttermaking from camel milk (Asresie *et al.*, 2013).

3.2. Cheeses

In Eastern Ethiopia, in Jigjiga and Shinile Zones majority of the pastoralist claimed cheese cannot be made from camel milk unlike cows' milk and milk of small ruminants, camel milk doesn't readily coagulate. However, few of the pastoralists indicated that although difficult, but cheese can be made from camel milk by mixing it with milk of other species (Eyassu, 2007). Mehaia (1993) reported that an acceptable quality of Domiati cheese with a satisfactory gross composition and yield and with good flavour can be made from a mixture of camel and cow milk. The difficulty of coagulating camel milk using commercial rennet was reported by Ramet (2001) and Farah and Bachmann (1987). It takes four times as much rennet to coagulate camel milk as compared to cow milk (Ramet 2001) and coagulation time of camel milk is two to three folds longer than that of cow milk (Farah and Bachmann 1987).

Soft cheese can be made from camel milk. The fat is bound to the milk proteins and the casein is also different from that of other animals. The alpha and beta caseins were found to react much more slowly on electrophoresis. Nevertheless, several plants that make rennet coagulated cheese from camel milk exist. The Tourag nomads on the other hand say that cheeses cannot be made from camel milk, as it does not curdle, and so discussion on cheese making in the Sahara is restricted to cheeses made from milk of other animals (Gassem, 2007). The difficulty in making cheeses in the Sahara most probably refers to the technique which is being used. (Gassem, 2007). The reason for this is said to be that the camel spoke to the Prophet Mohammed and it was agreed that no cheeses would be made from her milk and that her wool would not be dyed.

3.3. Fermented milk

Under warm conditions raw milk does not keep for long and actually its fermentation appears to be a means to preserve it not only for a limited period of time. Fermented products have various names in various parts of the world (Aggarwala and Sharma, 2005). In the Caucasus it is called kefir; in Armenia, matzoon; in India, dahdi; in Sardinia, giogdu; in Bulgaria, yoghurt; in Ethiopia, Dhanaan and in Syria, Israel and Egypt, lebben.

Dhanaan is said to have a shelf life of about 5 months. Similar products from camel milk were reported from Kenya, Somalia and Sudan. Naturally fermented camel milk products namely *susac* and *shubat* are produced in

Kenya, Somalia and Sudan (Aggarwala *et al.*, 2005). Similarly, fermented sour milk called *gariss* is made from camel milk in Sudan by placing raw camel milk in a skin bag hitched to the saddle of a camel that is allowed to go about its business (Abdelgadir *et al.*, 1998).

No information has been reported about the properties and potentials of the fermented camel milk product *dhanaan* produced in Eastern Ethiopia, in Jigjiga and Shinile Zones. Pastoralists make *dhanaan* from camel milk because they believe that it has high nutritional value and long shelf life, it enables collection of milk over a few days and thus facilitates delivery of milk to the market, it eliminates seasonal surpluses of milk, its taste is liked by the consumers, it has high demand in the market especially by urban dwellers, and it quenches thirst (Eyassu, 2007). Most of camel owners in Eastern Ethiopia, in Jigjiga and Shinile Zones mentioned that when making *dhanaan*, the milk in the container should be kept closed; otherwise the fermentation process doesn't take place. This suggests that the microorganisms responsible for souring or fermentation of camel milk are probably thermophilic anaerobic types (Eyassu, 2007).

4. Conclusions

Fresh dromedary camel milk, fermented milk and their products are a good nutritional source for the people of pastoral community in Somali Regional State. Various dairy products were reported to be produced successfully from camel milk with some modifications to their production procedure and some difficulties were reported. Fresh and fermented camel milk were reported to provide particular health benefits to the consumer in pastoral community depending on the bioactive substances in milk. More extensive research is needed to confirm this proposed traditional consumption, health benefits and its derived dairy products in the pastoral community.

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