

# Camel Milk

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“The main purpose of writing this article, with lot of short comings, is to look into untapped camel milk potential in Pakistan and from it develop various products of commercial value. Such ventures have been successfully tried in UAE and Kenya. With existing population of camels in Pakistan this camel milk trade can be taken up.

## 1. Introduction

The biggest problem of man kind today is malnourishment. For the prevention of malnourishment camel milk can play an important role. Growing and raising foodstuff in the hot and arid zones of the world is precarious and in such areas camels can benefit man. Camels or the family of camels the *Cameledae* are found throughout the world. This paper deals only with the one humped dromedary which is found in desert and semi desert areas of Asia and Africa. Milk is the main food obtained from herd of camels. The camels were and still are valued as riding, baggage and work animals as well as provider of hair and hides. In arid zone the camel is better provider of food than cow. Two major families of camels are:

- (i) One humped camels – Dromedary
- (ii) Two humped camels – Bactrian

First type is found in Pakistan, India, Gulf States and Saudi Arabia. The second type is found in Iran, Turkmenistan, Crimea, Mangolia & China.

Camels owing tribes are continually on the move, looking for grazing and water for their animals. They can wander over 1000km in a season. Rapidly expanding urbanization are causing clashes between cultures and destroying areas of the camels. Camels play an important role, because of their importance as a means of survival of the desert dwellers. When a child is born, he is presented with a female calf. In other societies, the camel is used for attracting wives or paying of criminal offences. In Kenya, the camel is the most important livestock. Most of their culture revolves round the camels owing to the animal ability to survive the extreme aridity and to supply milk which is the staple diet of Kenyan tribes.

In Pakistan as well, there are areas with extremely arid pastures in which the

only livestock that can produce milk, meat, wool and skin is the camel. The camels are also valued as pack animals carrying upto 600kg on their backs and are also used for pulling carts.

## 2. Camel Milk Production:

The camel milk production of Pakistan, India Gulf States and Saudi Arabia shall be discussed here.

While discussing milk and location in general, two aspects are to be taken into account. First the amount of milk produced per day per location and secondly type of milk produced. Animals living in cold areas and or near the sea give different quality of milk from those living in hot climates. This also applies to fast growing animals as compared with slow growing animals.

The main food of desert nomads is camel milk. The normal family has to share milk with the calves, produced by the herd.

Fresh figures of production of milk are not available as there has not been much research carried out on camels available in various parts of the world.

**India:** The geographical distribution of camels (dromedaries) in India is in the states of Gujrat, Haryana, Maharashtra and Madiha Pardesh. The camels are milked twice a day. The average milk production is between 2.5 - 6kg but often 15kg per day is milked.

**Pakistan:** The dromedary camel is found mainly in Sindh, Baluchistan & Punjab provinces. The length of lactation varies 270-540 days. Daily milk yields of 15 to 40kg have been recorded. Total milk yield in Sindh & Punjab ranges from 1350-3600 Kg per day. Lower milk yields are found in areas where feed supplies are poor and under desert conditions. As much as 22kg per day were obtained from some camels. The heavy Pakistani camels having access to green fodder produced an average of 35kg per day. They are milked twice a day Pakistan and Afghanistan camels are supposed to produce highest yields of camel milk.

The production of milk of a Bactrian camel, however, averages 2.5-5kg day.

**Saudi Arabia:** The dromedary camels have been originated from Saudi Arabia. There are still hundred of tribes who own these camels. In Saudi Arabia milking of camel milk is being done by machines. In far flung areas, tribes still use the same milking methods which were probably used for the first domesticated camel. Milk is still shared with calves.

An interesting phenomena was discovered when research was carried out on intestinal lactase concentrations in various ethnic groups in Saudi Arabia. The people were found to have the highest lactase levels. This indicates the importance of camel milk for the survival of desert nomads.

**UAE & Other Gulf States:** Camels are available in large number. Lot of work has been initiated in UAE for the beneficitation of camel milk. Infact, a couple of Companies, engaged in research of camel milk, have been established. One of the outfit Al Ain Dairy has developed powdered camel milk which is being exported to Austria for the manufacture of chocolates.

### 3. Composition of Camel Milk

The data concerning the composition of camel milk vary greatly. This may be

partly attributed to the inherited capabilities of the animals, but the stage of lactation, age, and the number of calving also play a role. Of the special significance to the quality of produced milk are the feed and water quantity and quality. Most milk is drunk fresh. It is also consumed when slightly sour or strongly soured. The fresh milk has a pH of 6.5-6.7.

The most important content of camel milk is the water content. This water content of milk fluctuates from 84-90%. With the increase in water content of milk produced by thirsty camels, there was decrease of fat content from 4.1 to 1.1%.

The sp. gravity of camel milk is less than cow, sheep or buffalo. The first milk, the colostrum is white and diluted as compared with clostrom of cow.

Various contents of constituents of camel milk are as follows:

- i) The clostrom in most of the countries is considered unsuitable & milked on the ground.
- ii) The water content of camel milk fluctuats from 84-90%.
- iii) In the literature, the % age of fat content in camel milk fluctuates from 2.6-5.5%. The milk fat is also different from that of other animals.
- iv) The fatty acid composition of camel milk fat is found to be as follows: (in wt % age)
  - Butyric acid 2.1, caproic acid 0.9
  - Caprylic acid 0.6, Lauric acid 4.6
  - Myristic acid 7.3, Palmitic acid 29.3
  - Stearic acid 11.1, Oleic acid 38.9
  - Linoloic acid 3.8
- v) The molar % age distribution of glycerides in camel milk fat is as under
  - Fully satirated glycerides 25.6%
  - Mono also unsaturated 37.8%
  - glycerides
- vi) The milk protein content of camel milk ranges from 2 to 5.5%, which is similar to that of cow.
- vii) The casein content of Dromedary and Bactrian, as has been reported, is 2.7 and 0.89% respectively.
- viii) The mineral content of camel milk is expressed as total ash.
- ix) The camel milk is rich in chloride. This accounts for its salty taste.
- x) The camel milk is rich in Vitamin C

which varies between 5.7 & 9.8 per cent. This value increases with the increase of lactation. Vitamin C levels are three times that of cow milk and one and a half times that of human milk. The milk also contains Vitamin B1, B2 & B12.

- xi) Camel milk is renowned for its health giving qualities, which include good bone growth. From all the data studied, it is clear that camel produces nutritious milk for human consumption. It is also evident that the taste and quality of camel milk is directly effected by the amount of water drunk and the quantity and quality of feed eaten. The fluctuations in fat, protein and salt are determined by the amount of water drunk by the camel.

### 4. Products from Camel Milk

There is much truth in the quotation from Holy Quran that "The camel was given to man as a gift from God".

Milk products are made from camel milk and the milk itself is used for purposes other than simply nutrition. It is also often unclear, therefore, if some of the products can be made from camel milk alone or if the milk is used in mixture. This is often the case when camel milk is mixed with fresh or churned goat milk. This mixture is made with certain quantities of camel milk added until required taste is obtained.

#### 4.1 Fermented Milk Products

Under warm conditions, raw camel milk does not keep for long and actually its fermentation appears to be a means to preserve it only for a limited period of time. Fermented products have various names in various parts of the world. In the caveasus, it is called Kefir.

In Armenia: Matzoon,

In India: Dahdi

In Sardina: Gioddu

In Bulgaria: Yughurt

In Syria, Israel Lehben and Egypt

The method of preparation of "Fermented Milk" consists in heating the milk to the boiling point in order to kill bacteria. It is then cooled to body temperature and a small quantity of previously fermented milk is added which will work as starter. This milk is well stirred and kept

overnight at ambient temperature. By next morning it has curdled. At this stage, it has acquired soured taste and typical flavour of fermented milk.

### Chal

The chal is prepared by souring it in a skin bag or ceramic jar of 30kg. Previously soured milk is added to the fresh milk. It is well mixed and each day for 3-4 days, fresh milk is added to the mixture. Eventually, the end product must have 3-5 times the original volume of chal that was initially added. Camel milk does not sour at temperatures below 100C and this is for 72 hours. At 300C milk sours in approximately 8 hrs compared with cow which in 3 hrs sours. The comparison between the composition of camel milk and camel chal is as follows.

	Camel Milk	Chal
Acidity	18o	26o
Fat	4.3%	4.3%
Lactose	2.75%	1.32%
Non-Fatty Solids	8.2%	6.6%
Ash	0.86%	0.75%
Ethyl Alcohol	0	1.1%
Ascorbic Acid	5.6 mg %	4.8 mg %

### Butter / Butter Milk

The method of making butter and butter milk is summarized as follows:

- i) Fresh milk is poured into goat skin and allowed to ferment for 12-14 hours at 25-300C.
- ii) Then the fermented milk is churned for 15-20 minutes at 12-18C. Butter and Butter milk are obtained.
- iii) Butter is mixed with clarifying agent and heated at 100-1200C for 30 minutes so as to obtain preserved butter fat.
- iv) Butter milk is used to make dried cheese or to prepare soup, and or after sauce and water has been added is consumed immediately. Butter obtained from camel milk is not eaten as butter. It is sometimes used as cosmetic by women. Camel butter has hard consistency than the butter of sheep milk. It is mostly used in cooking.

### Butter / Lagsi

The fermented camel milk is churned with little water and is called "Mattha". When water is added and butter is removed, the remaining liquid becomes Lagsi.

#### 4.2 Khoa & Other Non-Fermented

**Khoa:** It is prepared by evaporating water from camel milk through heating by continuously stirring the milk to prevent scorching. At first the mass left over has a buttery consistency, but after cooling, it turns into a semi solid dough with sweet taste Khoa can be kept for 200 days. If sugar is added it can be kept for longer periods.

**Rabri:** It is also made by heating camel milk in a shallow iron pan over a hot fire. When the milk reaches a fifth to eighth of original volume, it is removed from the fire. The mass is gently mixed without damaging the flakes that have formed. Sugar is added and it is then allowed to cool.

**Malai:** It is made by allowing large quantity of milk to simmer gently over a steady fire until thick layer of milk fat and coagulated proteins form on the surface. It is then removed and allowed to cool.

**Cheeses / Casein:** Camel cheese is impossible to make as it does not coagulate easily. Soft cheese can however, be made from camel milk.

The fat is bound to the milk proteins. Its casein is also different from that of other animals. Several plants that make rennet coagulated cheese from camel milk exist in USSR. A Danish dairy Company CHR-Hansen has commercially produced an enzyme for the production of camel cheese. Casein can be produced from camel milk and the product is called "Industrial Casein".

### 5. Medicinal Properties

- i) In India camel milk is used therapeutically against dropsy, jaundice, problems of spleen, tuberculosis, asthma, and piles. Patients with acute hepatitis had improved liver function after being treated with camel milk.
- ii) Camel milk is laxative on people who are unaccustomed to drinking camel milk.

- iii) Camel milk is used as tonic to the sick, the elderly and the new born babies because of belief that it is not only healthier but works well in the bone formation.

### 6. Camel Products other Than Milk

#### Meat

Camel meat is not universally eaten. In the pastoral communities, camel meat is only eaten on special occasions. The camels belonging to tribes will not be normally slaughtered as they have been named and form part of the family. The body weight of slaughtered camels weighs average 400kg or more. The camel meat can be preserved by cutting it into strips for drying. It is then preserved by putting the dried strips in clarified butter fat. In Northern Kenya, camel blood is consumed as it supplies necessary iron salts and other essential nutrients. In countries like Libya, Sudan, Saudi Arabia and Egypt, camel meat market exists. The camel meat is exported from one country to an other.

#### Hair & Wool

The production of wool and hair of adult animals ranges between 1kg to 5kg. The Bactrian camel gives more wool than the dromedary and its wool is of higher quality. The wool of a camel is used for making padded cloth, quilts and mattresses, tents, carpets, saddle girth and blankets.

#### Skins

Camel hides are used for making shoes and sandals. The hide of dromedary is not of good quality and is used for making whips and saddles. Hide is also used for making container for water and milk.

### 7. Feed & Digestion

The yield and quality of milk produced by a camel depends on the composition of feed available including liquid. The lactating animal in an arid area has to overcome shortage of water as well of forage. The fodder that is available can also affect the composition and taste of milk. The drinking water has a direct affect on milk, fat, and protein. A limited availability of water causes a decrease in milk fat and protein content.

The camels in draught areas have ability of utilizing plants that grow well under arid conditions. Examples of such plants are

camel's thorn, acacia and salt bushes. The camels ability to utilize the scanty fodder resources growth and production makes the camel a potentially important source of food.

### Feeding Habits

The main forage is obtained from trees and shrubs. The diet is made up of species of Acacia, Indigofera, Dispera and Tribulus. The Camel's graze in the early morning and late afternoon which are the coolest times of the day for feeding.

The grazing camel has low feed requirements. They eat 8-12 kg/day dry matter about 30-40 kg of fresh pasture with 80% water content. Normal daily feed intake averages 10-20 kg fresh feed i.e. 5-10 kg dry matter a day. Water requirement per camel/day varies 15-30 litres. In arid areas, camel can survive @ 4.5 litre/day water requirement.

### 8. Viral Diseases

Following viral diseases are common in camels: (i) Camelpox, (ii) Rinder Pest and (iii) Footand-mouth disease is sporadically found but on the whole camels are unaffected.

### 9. Demand of Camel Milk in Pakistan

Camel milk is largely a subsistence product but production in camel milk dairies is a growing industry. Camel milk is rich source of proteins with potential antimicrobial and protective activities. These are not available in cow milk. Camel milk is whole food. Pakistan and Afghanistan camels are supposed to produce the highest yields of milk, upto 30 liters per day.

Camel herds are visible in number in Seraiki and Sindh region. The yield of milk from Seraiki belt is averaging 20-25 litres while those from Sindh region where green fodder and trees are in abundance, the yield of milk is averaging 35 litres. The camel population from Pano Aqil to Ghotki is quite high. This is the entire area which needs to be tapped by approaching herd owners for the collection of camel milk. Camel milk is getting known to public. In Islamabad, camel milk is being sold by camel keepers. There are a couple of shops in Karachi where camel milk is available and people drink it for the improvement of their health. Camel milk, mostly imported is also available in Super Stores.

Unlike Pakistan there is considerable activity about research and development of products based on camel milk. Some of these products are also being exported. UAE citizens and expatriats enjoy ice cream prepared from camel milk in four flavors date, saffron, caramel and chocolate. Another product Camelicious (R) has appeared in Dubai market from CVRL laboratory. It is rich in vitamins and minerals and known to boost the overall immune system. Camelicious will be available in 250 ml, 500 ml, and 1 litre bottles in super markets.

**Following are some of leading Companies which are engaged in camel milk and products business:**

1. AlAin Dairy
2. Kamelen melk
3. Oasis Camel Dairy
4. Tiviski SA
5. Vital Camel Milk Ltd,

### 10. Discussion

The road to success for harnessing camel milk potential available in the country requires deeper studies including detail area wise survey. If camel milk potential in Pakistan is harnessed, it shall provide an alternate source of milk other than of goat, cow and buffalo.

What makes camel so special in the deserts and semi-desert areas is its ability to survive severe draught conditions. The low water turnover enables the camel to graze relatively far from water resources and to replenish losses in a very short time.

Milk production of camels in draught areas can be a valuable source of food for human population. In times of severe draught, the Camel can be the only animal that will digest the remaining flora, and on it can produce milk and meat for human nutrition. When faced with lack of drinking water, the milk production of the camel is unaffected. In rain fed agriculture, the camel is better producer of milk than any domestic animal.

The four conditions that must be met before pastoral industry in least developed areas can be undertaken are:

- i) Availability of free land
- ii) Demand for animal products
- iii) Low labour requirement
- iv) Suitable animals for breeding and herd improvement

Traditional camel rearing has no future. Camel husbandry needs to be revolutionized. The traditional role of Camel is disappearing, therefore, new and improved methods of camel raising must be initiated that will enable to utilize the natural ability of the camel to produce milk, meat, fiber, hides, skins and energy in areas where other animals cannot produce or produce with difficulty. Camel rearing must not be abandoned as it is often the only way to utilize vast desert areas. Modern technology and society can aid camel rearing as a source of food. There is need to develop a system of approaching camel herds from where milk can be collected and brought for further treatment, packing and marketing.



## 11. Recommendations

1. Studies in order to ascertain various sectors of camel milk trade have to be undertaken.
2. A fresh study to know the population density of camels has to be taken up in Seraiki and Sindh regions.
3. Based on special camel milk properties, a foolproof procedure of collection, transportation, treatment and packaging has to be developed.
4. Camel can be reared with sheep, goat and cow.
5. Camel breeding practices should be modernized and improved.

## 12. References

The list of references is many consisting of several number A-4 size pages. We have only included research work so far carried out in Asian & African Continents. These references being listed are, however not recent ones.

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