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Research Article

Microbiological and chemical analysis of camel milk

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Abstract

Camel milk is important source of protein, vitamins and minerals, and is particularly rich in calcium, which is essential for healthy bones and teeth. Research suggested that antibodies in camel's milk can help fight diseases like cancer V/Aids, Alzheimer's and hepatitis B. Camel milk needs to be further investigated. Yet camel milk is an important source of proteins for the people living in the arid lands of the world. Only the main parameters of camel milk were taken into account: Fat Matter (FM), Total Protein (TP), Lactose (L), Dry Matter (DM) and Ash. The chemical composition of camel milk was studied. Result showed Fat 3.67%, Protein 3.22%, Dry Matter 11.05%, Ash 0.71%, Specific Gravity 31.6%, Acidity 0.165g/lit, Water 88.95%.Most camel milk is drunk fresh. It is also consumed when slightly sour or strongly soured. Camel's milk is generally opaque white. Normally it has a sweet and sharp taste, but sometimes it is salty. At time the milk tastes watery. Fresh camel's milk has a high pH. The pH of milk is between 6.5-6.7. Most important factor of camel milk is water content. Water content of camel milk fluctuates is from 84%-90%.

Keywords: camel milk, chemical composition, water content.

Introduction

Malnutrition is the biggest problem of modern man and camel milk can certainly play an important role in preventing malnutrition. Farming and food production for the population living in hot, arid regions of the world, the camel is one of the few animals that can survive in this environment, and it will be beneficial to humans.

Milk is a staple food that can be gained from a herd of camels (Dahl, 1979). Dromedary camels around three thousand years before Christ, in Southern Arabia, especially for meat and milk were domesticated (Bulliet, 1975).Pet camel is riding, Freighter, labor, and it has also been used as a source of skin and hair. In dry area camel is better than cattle, as food source because a cattle is very sensitive to lack of water, food and heat (sweet, 1965). Camel, when the continents were joined together, originated from North America (Lewis, 1963).At that time; camel was the size of a rabbit and in the courses upper Eocene, Tertiary and Pleistocene, those forty million years longer remains the same size. The continuing evolution is led to the creation of current coarse camel.Camels moved from North America to other parts of the world until it finally disappeared from the place of their origin. Different types and breeds that are found in most camel family result of an

evolutionary adaptation to different environments of life that the camels are located. Some camels moved to desert and semi-desert areas of North Africa and Middle East.

Camel remnants have been found in ancient Palestine, which dating back to 1,800 years BC. Camel migration was stopped due to a higher sensitivity to Trypanosome in Africa (Field, 1979). However, camel as a possible host Trypanosome in North Tse Tse areas stricken is known, and the disease across Africa and from there to Asia are transferred. Camels are single-Bactrian, long legs and spindle-shaped.

Bactrian camel was domesticated on the border between Iran and Turkmenistan, and expands to the Crimea, Southern Siberia, Mongolia and China. Bactrian camel is dromedary than single-Bactrian camel and also Bactrian camel has thicker wool. All members of the camel family are order of Artiodactyla and rank of Tylopoda. Camels were two species at continental integration period:

Camelus dramedarius
Camelus bactrianus

Lamaha groups are three species that emerged after the separations of the continents and Vicugna group is only one species.

Camels are ruminants but with actual ruminants have difference in some anatomical feature (Cloudley-Thompson, 1968).

Adult camels have two incisors in their upper jaw. Adult camels have not gallbladder and also omasum that is a part of water reabsorption.
Camel meat as a food source is not suitable for meat production in India Hindus, Egyptian Christians Cpots, Iraq Mondaeans and Syria Nasairois.
Camel rearing tribal, move to search of pasture and water for their animals constantly (El Amin, 1979). The tribes can migrate more than 1,000 miles per season and the extent of migration depends on the availability of food and water.
Camel often plays an important role in the cultural and social background of breeder tribes, and this is due to the importance of camels in desert survival. For example, in different cultures camel property begins with the birth of a son, female camel is gift to male children (Hartley, 1979).Cord placed in bag and close to the neck of camel. In other communities, camel is used as attractive of women or as a penalty for criminal offense (Dickson, 1951). Camel has been introduced in different parts of the world in arid regions as draft animal especially. Camels were introduced as draft animals, in Italy, Spain, South Africa and Texas, that was used only for a short time. Camel moved to the Canary Islands and used for agriculture and transportation in 1402 (Bulliet, 1975). Sudan has one of the largest populations of dromedary camels in the world (El Amin, 1979). In Sudan such camels are found in desert and semi-desert areas, where the average annual rain fall is less than 350 mm.

In Africa camels are seen in arid and semi-arid pastures of Ethiopia, Somalia and Kenya. In these areas people are mostly shepherds and camels go upon the location of pasturage to another place.

Migrations of camels to outlying areas of life are divided into two groups: away migration of dry herds and close migration of lactating herds.

In Ethiopia and Somalia shepherds are classified their animals to:
Dairy cows, lactating camels, non lactating camels, Sheep and goats (Lewis, 1974).

Somali shepherd are two types of herding units:
The first type is camels that the single young men are responsible to their shepherd and sometimes hundreds kilometers distances away from the wells are taken to pasture. The second group are lactating animals that family are responsible to their shepherd includes, husband, wife, unmarried girls and boys.

In rainy season, when food is available abundance, two herding unit join together and with an abundance of milk and meat, celebrate the public traditional ceremonies.

Camel is still important to Gabra and Rendyl tribes in Northern Kenya (Sato, 1976; Torry, 1973). This tribal culture is largely based of camel, because camel is able to survive and milk production in the driest weather (which is the main diet of the tribes).

Very dry pastures existed in Pakistan that only these animals are able to produce of milk, meat, wool and skin (Knoess, 1979).

Camels are used as freight animals that carry up to 600 kg and used for pulling carts.

Bactrian camels have viability in China, Mongolia and Russia (Dong Wei, 1979).
Camels in this region are used as domestic freight, passenger and appropriate animal for drought.
The annual output is 1500 tons of wool, which is important. Meat and milk of camel in these areas are less important (Dong Wei, 1981).

Questions are answered include:
1 - Which features of camels leads to eminence, especially Arab dromedary camels? Or how these animals are able to higher adapt to the environment?
2 - Is it possible for humans to improve the camel feature?
3 - If camel is more useful to humans, so why has so far not been used to this extent?
4 - What is the composition of camel milk? How much is camel milk production? What is the rate of camel fertile?
5 - What is camel feeding?
Camel has very high economic capacity in arid area and the only animal that can survive in such conditions, while other animals are in trouble to survive in these conditions and can not to use for the production of meat and food.
When camel owners are disabled, camels destroyed. Camel ability is not ignored to food production in drought periods. In many parts of the world, the services development, especially roads, has led to lose its value as an animal riding and cargo, and now motorized transportation takes place to the farthest corners.
In countries like Afghanistan, Pakistan and India, where motorized transportation is too expensive or undeveloped areas is not suitable for motorized transportation, camel is still a very useful animal.
In dry areas can found to tremendous economic value of the camel than other animals.

Reasons for choosing the topic

The chemical composition determination of these animals milk as a valuable food source to provide part of human nutritional especially pregnant women, nursing mothers, the elderly and children is good looks.

Camel milk is produced even in unfavorable weather conditions and food, and also animal feeding rate is reduced so the chemical composition determination of camel milk would be helpful.

In addition, total microbial count determination of camel milk examined amount of sanitation during milking animals and possible difference with cow's milk and other species.

Experiment perform with total microbial count is inform of the health status of milking procedures, storage and transport of milk.

Statement of the problem

Camel is only animal that in unfavorable conditions and several days without drinking of water and food that is inferior and inadequate in terms of quantity and quality to other ruminants can continue to live.
Camels are very hardy animals and camels breeding are very affordable.
Camels are all purpose animals and can be used in relocation and transport also milk, meat, wool and skin of camels.
The average lactation period of camel is 18-8 months and milk production in unfavorable condition is not interrupted and only the composition of milk and daily production rate is reduced which can be used to supply of human food.
In the FAO report , the chemical composition of camels in many parts of camel breeding have been published and in this report although there are number of camels in Iran but name of Iran cannot

see in the list of countries that the chemical composition of milk has been investigated.

With this study in Golestan province and other place of camel breeding can informed of Iran's position.

Review of Sources and available information:

Information of milk composition is very variable. These changes are due to inherited characteristics or factors such as stage of lactation and age.

Quality and quantity of water and nutritional of camel is especially effective on the quality of camel milk.

Camel milk is often used fresh and sometimes in low and high levels of acidity. It is usually opaque white (Dilanyan, 1959; Kheraskov, 1953; Yagil, 1980).

Camel milk taste is normally sweet and spicy but sometimes salty (Rao, 1970).

There is a negative outlook in urban areas of specific countries to camel milk. It is thought that there is an unpleasant taste (Yasin and Wahid, 1957). Camel milk taste is depending on the availability of forage and water. If you are moving slowly, it wills frothy (Shalash, 1979).

Fresh camel milk has high PH (Grigoryants, 1954). PH of milk is between 6.5-6.7(Shalash, 1979). Camel milk acidity after over the time increases rapidly. Lactic acid from 0.03% to 0.14% increases after 2 hours.

The average of milk dry matter (TS), 3 hours after delivery is 20.4%. During the first 2 days of lactation, dry matter of milk is reduced to 18.4%.This is due to reduce of, total amount of protein and minerals in milk. This decrease is not due to fat content, because it was initially low (initially is 0.2% later increase to 5.8%).

Studies conducted by (Yashi & Ahri1961) in camel colostrums

Table 3-1 Chemical composition of camel colostrums

Density15.5˚C	Variation range (%)	Mean (%)
Fat	**0.1-0.4**	**1.079**
Proteins	**15.79-19.52**	**0.15**
lactose	**3.98-5.14**	**17.78**
Ash	**1.44-2.80**	**2.60**
Acidity (percent)		
Lactic acid		**0.38**

Overall compositions of camel milk in different regions of the world are shown in Table 9-2

Analysis of monthly lactating period shown until sixth month, then in the twelfth month and finally, at the end of 14-17 month that average composition of milk during the first month of lactating remain constant in the prime six month(Sestuzheva, 1958).
Camel milk density is less than cow and sheep milk (Shalash, 1979).
The water content of camel milk is varies from 84% to 90% (Knoess, 1976).
The amount of fat in thirsty camel reduces from 4.3% to 1.1% when the water content of camel milk increases (Yagil and Etzion, 1980).
In available Studies and finding, camel milk fat is varies from 6.2 % to 5.5% (Yasin and wahid, 1957; Knoess, 1976). Milk fat will determine of ingested forage and amount of animal thirst.

Camel milk fat is different from other animal milk fat. If milk set aside, milk fat is distributed throughout of milk to small globules form (Yagil and Etzion, 1980). Fat cells are very small. Fat cell diameter is 1.2-4.2 micron (Dong Wei, 1981).
The ratio of milk fat to milk dry matter is 31.6 %. This amount in buffalo is 40.9% (Shalash, 1979).
Amount of milk fat is related to the amount of protein content (Khan and Appena, 1967). This is Due to the fat formation in butter production yogurt (Rao, 1970). The difference in milk fat, which makes for extraction of vitamin A and carotene in soap making, is need to camel milk (Khan and Appena, 1967).

Camel milk fat has less short-chain fatty acids than cattle and buffalo milk fat, but the number of long-chain fatty acids is identical (Dhingra, 1934).
Camel milk is valuable for linoleic acid, Vlatyl acids and polyunsaturated acids which are essential to human fueling (Kon, 1961).
Amount of protein content in camel milk is varies from 2% to 5.5% (Yasin and Wahid, 1957).
Casein and albumin content of Dromedary camel milk is 0.89% and 0.97% (Dilanyan, 1959).
Amount of camel milk protein is very low in dry camels and this is indicates that water has a direct effect on milk composition (Yagil and Etzion, 1980).
Amount of mineral content in camel milk is called total ash. This amount is very variable in camel milk and the lowest amount of ash is found in dehydrated camel milk (Yagil and Etzion, 1980).
Camel milk is high in Chloride (El-bahay, 1962). Although dehydrated camel milk is show decreases in fat, protein and lactose but sodium and chloride are increases (Yagil and Etzion, 1980). This is cause taste of milk to salty (Yagil and Etzion, 1980).
It seems all animals with four nipples; have similar milk compositions.
Camel milk is very similar to goat's milk and camel milk is comparable to human milk easily. This point shows the importance of camel milk for human nutrition.

It is well known that the taste and quality of milk is directly affects to the amount of water and quality and the amount of forage consumed. Fluctuations in Fat, Protein, and salt, are affect the amount of water consumed and changes in pasture (Yagil and Etzion, 1980).
In Kenya, camel breeders are feed of camel milk only (Field, 1979). Those people live in the desert are extremely healthy and robust. Camel milk is known to improvement of health, including bone growth (Kon, 1969).

General Purpose and Specific Goals

A: General Purpose

Microbiological and chemical analysis of camel milk

B: Specific Goals

1- Measurement of milk fat
2- Measurement of milk protein
3- Measurement of milk ash
4- Measurement of dry matter and humidity
5- Measurement of Acidity
6- Measurement of Specific gravity
7- Total microbial count

Variables:

In this project interest variables in 100 sample of camel milk are as follows:

1- Amount of fat
2- Amount of protein
3- Amount of ash
4- Amount of dry matter and humidity
5- Amount of acidity
6- Specific gravity
7- Total microbial count

Number and sampling method:

To chemical composition study and total microbial counts of camel milk collected 100 samples by stratified random sampling from Golestan province, samples cooled and transferred to laboratory.

Measurement of milk fat by Gerber method:
Instrument:
1-Butyrometer
2-Pipette
3- Sulfuric acid
4-isoamyl alcohol
5-Gerber centrifuge

Procedure:

1-Carefully pipette or dispense 10 ml of sulphuric acid into the butyrometer;

2- Carefully add 11 mL milk to the butyrometer, by letting it to slowly flow down the glass walls in order to it does not mix with the acid;

3- Pipette or dispense 1 ml of amyl alcohol;

4- Clean the neck of the butyrometer;

5- Stopper the butyrometer tightly using a clean, dry stopper.

6- Shake and invert the butyrometer several times until all the milk has been absorbed by the Acid

7- Place the butyrometer in a water bath at 65-75°C for 5 minutes. Mixing content from time to Time

8- Centrifuge for 4 to 5 minutes at 1200 rpm in the Gerber centrifuge;

9- Remove the butyrometer of the centrifuge and adjust the meniscus to accomplish the reading. Adjust bottom meniscus onto zero on butyrometer's scale using stopper. Read out fat content from low part of upper meniscus. Give the fat content with 0.05% result precision.

The reading value in the scale is the result of the percent fat in the milk (% mass / volume)

Measurement of milk protein by formel method

Instruments:

1- Erlenmeyer flask
2-Formalin 40%
3-Phenolphthalein
4-Potassium oxalate28%
5- Distilled water
6-0.1N NaoH

Procedure:

1-Pipette out 10ml samples of milk into a 50ml Erlenmeyer flask
2-Add 0.4ml saturated potassium oxalate solution and 0.5ml phenolphthalein indicator. set aside for 2minutes.
3-Neutralize the milk by titrating with 0.1N NaoH to the endpoint4.
4-Add 2ml of 40% formaldehyde solution and allow standing for 2minutes.
5- Again titrate with 0.1N NaoH to the same endpoint
6-Run a blank by titrating 2ml of 40% formaldehyde solution plus 10ml distilled water with 0.1N NaoH.

Calculation:

Va=volume of 0.1N NaoH used to titrate sample after addition of formaldehyde
Vb=volume of 0.1N NaoH used to titrate blank
Va-Vb=formaldehyde
Value %protein=Va-Vb*formal factor

Measurement of milk ash or Ash%:

Instruments:

1-Crucible
2-Scale
3-Electric Kiln
4-Water Bath
5-Desicator

Procedure:

1-Record weight of empty crucible

2-Add 5ml of milk to the crucible

3-Place in water bath till volume reduces
4-Heated the crucible into the electric kiln for 4-5 hr, 500 ° C, called calcination
5- Record weight of the crucible

W1= weight of empty crucible (1)
W2= weight of crucible (5)
n= milk amount

Ash %= (W2-W1/n) * 100

Measurement of total solid by evaporation:

Instruments:

1-Oven Temperature 103-102˚ C
2-Scale
3- Desicator
4- Aluminum container
5-Water bath

Procedure:

1-Record weight of empty aluminum container (it consider W1)
2-Add 5ml of milk in aluminum container, then place on the scale, regulate scale on zero
3-Place sample in water bath
4-Place aluminum container in oven, for 2.30hr, 103-102˚ C
5-Place aluminum container in desicator to cool
6-After cooling, record weight of aluminum container
7-Again place in oven for 30 minutes
8-Again Place aluminum container in desicator to cool
9- After cooling, record weight of aluminum container
(Note: twice consecutive weight will be stable record)
10- Last weight consider W2

Ts %= (W2-W1/n) * 100

Measurement of acidity by dornic method:

Instruments:
1-Beakers
2- Phenolphthalein
3- Buret
4- 0.1N NaoH

The titratable acidity is expresed as lactic acid and is determined by titration of a known amount of reconstituted milk with 0.1N NaoH using phenolphthalein as indicator.

Procedure:

1-Fill burette with the 0.1N NaoH solution (10ml burette is a good size for milk)
2-Add 10ml of milk into the beaker
3-Drop 3-5 drops of phenolphthalein into the beaker and mixes the beaker to distribute the phenolphthalein
4-Start dropping the 0.1N NaoH into beaker until gets a constant light pink color.swirl after each drop
5-Once get a light pink color, stop the NaoH dropping and measure/read how much NaoH used on burette markings

Calculation:

Lactic acid is an organic acid with one carboxylic acid, having a molecular weight of 90
One ml 0.1N NaoH therefore correspond to:
90×0.1/1000=0.009 g of lactic acid
If the titration requires e.g. 14.5ml 0.1N NaoH, the result is often expressed as:
14.5*0.009=0.13% lactic acid

Measurement of specific gravity:

Instruments:
1-Lactometer
2-Jar
3- Petri dish
4-Diary floating thermometer
5-Beakers

Procedure:

1-Heat the sample of milk to 40°c and hold for 5minutes
2-Fill the clean, dry glass jar about 2/3rd volume of it with milk
3- Lower the lactometer gently in the milk making sure that the lactometer floats freely without touching the sides of the jar
4-Add milk to brim of the jar
5-Read the lactometer reading at the top of the meniscus within one minute
6-Record the temperature of milk

Calculation:

Specific gravity of milk can be calculated by the following formula:
Sp.Gr= (corrected lactometer reading/1000) +1

Total Microbial count:

Instruments:

1-Plate
2- Pipette
3- Test tube
4- Distilled water
5- Incubator

6 - Nutrient agar

Procedure

1- Prepared 6 test tubes for dilution
2-Add 9 ml of distilled water in each tube
3-Add 1ml of milk in first test tube
4-start dilution until last test tube
5-Used test tube 10^{-4}, 10^{-5}, 10^{-6} for total microbial count
6- For each dilution consider a plate, 1ml of dilution add on nutrient agar
7- Maintained medium 72 hours in an incubator 30˚ C, then counted

Results

The following results were obtained on 100 samples of camel milk:

Total microbial count obtained maximum 185000 and minimum 130000 colonies that counted average of 155,000 colonies.

Discussion

In camel milk average amount of fat, protein, dry matter, ash, specific gravity and acidity are regularly 3.67%, 3.22%, 11.05%, 0.71%, 31.6 and 165 g/lit.

The characteristics and features of camel milk can find out according to the obtained results and comparison of camel milk with milk composition from other species based on obtained information of Robert and Bermel from Wisconsin University and handbook of milk composition, Authoring, Jensen R. G 1995.

Camel milk is usually opaque white, normally sweet and spicy taste and sometimes salty taste. Camel milk is sometimes watery. If camel milk mixes too slowly, be foamy. Fresh camel milk has a high PH, between 6.5-6.7, this PH is similar PH of sheep milk (Shalash,1979). Camel milk acidity is increasing rapidly with over time.

According to the above table and comparison of camel milk with milk composition from other species can find out similarity between cow milk and camel milk, but amount of fat in camel milk is less than cow milk. Generally the amount of the protein percentage of milk has a direct relationship with the amount of the fat percentage of milk and if milk fat is high so milk protein also is high.

According to the camel milk composition in different regions of the world can find out to differences between the amounts of fat, protein and other compounds that are caused by Climatic conditions, management, nutrition and breed of them.

According to studies, milk compositions are not under affect of breastfeeding, the number of milking and fitness. Differences of milk fat and protein in different regions are directly related to breed, nutrition management, breastfeeding stage and milking techniques.
Duration of breastfeeding from region to other region is varies from 8 to 24 months and amount of production is varies from 1,500 to 12,775 kg.

Table 8-1 chemical analysis result of camel milk (Average)

Fat	**3.67%**
Protein	**3.22%**
Dry Matter	**11.05%**
Ash	**0.71%**
Specific Gravity	**31.6**
Acidity	**0.165g/lit**
Water	**88.95%**

Table 8-2 chemical analysis result of camel milk (Average)

Row	Ash%	Dry matter%	Volume weight	Protein%	Fat%
1	0.8	11.4	32	3.2	4.7
2	0.6	8.6	34	3.5	1.8
3	0.4	8.6	28	2.2	2.3
4	0.6	13.8	38	3.5	2.8
5	0.8	12.6	38	3.5	3.6
6	1	12.8	36	3.2	3.5
7	0.6	12	35	3.7	3
8	0.6	10.6	26	2.9	3.7
9	0.4	12.8	31	3.5	3.6
10	0.6	11.4	30	3.6	4.2
11	1	9.4	35	2.7	1.8
12	0.8	11	30	3.4	2.4
13	0.4	13.2	30	3.9	6
14	0.6	8.6	28	3.8	6.2
15	1	7.8	31	4.2	2.1
16	0.8	12	28	2.8	5.6
17	0.8	11	31	3.7	5.3
18	0.8	10.2	31	3.5	4
19	1	12	30	2.9	3
20	0.8	11	30	2.2	5.3
21	0.6	11.8	31	2.9	3
22	0.6	11	28	2.2	4
23	0.6	9	38	2.5	2.5
24	0.8	8.8	32	3.8	2.8
25	1	13.6	34	2.5	2.3
26	0.8	12	36	3.6	3.1
27	0.8	12	38	3.2	4
28	1	11	28	3.5	2.1
29	0.8	10	33	3.3	4.6
30	0.6	12.2	33	3.3	2.8
31	0.4	12	35	3	3.7
32	0.8	10.4	33	3.8	2.3
33	1	11.4	28	3	3
34	0.6	13	29	3.5	5.2
35	0.4	9.4	31	3.8	5.6
36	1	8.8	28	4.2	3
37	0.8	11	33	3.8	5
38	0.6	11	30	3.5	5.9
39	0.6	11.2	28	3	3.1
40	0.4	11.8	28	2.2	4
41	0.6	11.2	32	3.5	4.3
42	0.6	10.6	30	2/9	3.5

43	0.8	11.8	31	2.7	4.8
44	0.6	9	30	2.5	3.8
45	0.6	8.8	36	2.2	4.5
46	0.4	13	34	4.1	5.2
47	1	11.6	32	3 .1	3.3
48	0.8	11	28	2.9	3.8
49	0.4	12.8	38	3.2	5
50	0.6	11.2	36	2.2	4.3
51	1	11	32	3.2	3.7
52	0.6	10	34	4	5.1
53	0.4	12.2	30	3.8	5.7
54	0.6	11	30	2.7	2.4
55	1	11	35	3.6	2.9
56	0.8	11.6	30	3.2	4.3
57	0 .8	10.8	32	2 .5	2.2
58	0.8	9.4	28	3.9	4
59	1	11	32	3.9	2.7
60	0.4	11.4	28	4 .2	3.9
61	0.6	13	28	3.2	3
62	0.8	11	30	3.5	2.6
63	0.4	8.6	31	3.8	2.5
64	0.6	11.2	31	3.8	2.6
65	1	11	31	3.2	3.9
66	1	11.8	32	2.9	3.8
67	0.6	11.2	28	2.2	2.7
68	0.8	11	34	2.6	2.5
69	0.6	11 .8	36	2.6	2.4
70	0.8	10.6	35	3.5	3.2
71	0.8	11.2	38	3	3.8
72	1	11	38	3.2	2.7
73	0.8	10.6	28	2.9	2.5
74	1	11	35	4	2.4
75	0.6	11.8	30	3.2	3.2
76	0.6	10.2	31	3.5	3.8
77	0.4	12	30	2.8	2.8
78	0.8	11	30	3.3	4.5
79	1	7.8	28	2.5	2.3
80	0.4	12	28	4.1	4.9
81	0.6	11	31	3.2	1.8
82	1	13.2	31	3.1	2.9
83	0.6	9.4	31	3.7	5.4
84	0.4	11	30	3.3	5.4
85	0.6	8.6	28	3	3.3
86	1	11	33	3.2	4.7
87	0.8	11.4	32	3.5	3.5
88	0.4	12.8	31	3.2	5.3
89	0.6	10.6	32	3.2	4.5

90	**0.6**	**12.8**	**28**	**3.6**	**5.2**
91	**1**	**12**	**35**	**3.2**	**3.3**
92	**0.8**	**8.6**	**32**	**3.3**	**3.8**
93	**0.8**	**8.6**	**31**	**3.7**	**3.3**
94	**0.6**	**11**	**29**	**3.2**	**4.1**
95	**0.4**	**13.8**	**33**	**3.4**	**4.6**
96	**0.8**	**11**	**30**	**2.8**	**2.8**
97	**0.4**	**12.6**	**33**	**2.9**	**4.2**
98	**1**	**11.4**	**31**	**3**	**5.1**
99	**0.6**	**11.8**	**32**	**2.5**	**2.3**
100	**0.8**	**10.2**	**31**	**3.1**	**3.2**

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Table 9-1 Milk composition of various animals and comparison with camel milk

Species	Fat%	Protein%	/Protein Fat	Ash%	Dry Matter%
Antelopes	**1.3**	**6.9**	**5.3**	**1.3**	**25.2**
Ass	**1.2**	**1.7**	**1.4**	**0.45**	**10.2**
Polar Bear	**31**	**10.2**	**0.3**	**1.2**	**42.9**
Bufflehead	**1.7**	**4.8**	**2.8**	**0.96**	**13.2**
Buffalo Philippines	**10.4**	**5.9**	**0.6**	**0.8**	**21.5**
Camel	**3.6**	**3.2**	**0.8**	**0.7**	**11.05**
Cat	**10.9**	**11.1**	**1**	**-**	**25.4**
Cow : **Ayrshire brown** **Swiss** **Guernsey**	 **4.1** **4** **5**	 **3.6** **3.6** **3.6**	 **0.9** **0.9** **0.8**	 **0.7** **0.7** **0.7**	 **13.1** **13.3** **14.4**
Holstein	**3.5**	**3.1**	**0.9**	**0.7**	**12.2**
jersey	**5.5**	**3.9**	**0.7**	**0.7**	**15**

Table 9-2 Camel milk composition in other studies that have been carried out by scientists from different countries

Country	Fat%	Protein%	Ash%	Water%	Resources
Pakistan	**3.9**	**3.7**	**0.7**	**-**	Yasin&Wahid 1957
Pakistan	**4.2**	**3.7**	**0.8**	**-**	Kon&cowie 1961
India	**3.78**	**4**	**0.95**	**-**	Ohris&Joshi 1961
India	**3.08**	**3.8**	**0.7**	**-**	Khan&Appena 1964
Egypt	**3.8**	**3.5**	**0.8**	**87.9**	El-bahay 1962
Ethiopia	**5.5**	**4.5**	**0.9**	**85.6**	Knoess 1976
Iran	**3.6**	**3.2**	**0.7**	**88.95**	Katouki 2013

It is important that amount of milk production in camel is under dehydration affected, the camels have been placed on water restriction for an hour a day or ten days, there is no difference in milk production.

Normally milk cell counts are 400,000 to 500,000 cells per ml of milk and considering of total microbial count, the average of colony is 155000 which indicates low pollution of camel milk than other species.

Density of camel milk is less than cow milk, sheep and buffalo.

The most important factor in camel milk is the amount of water. Camel milk water is varies from 84% to 90%.

Amount of water does not limit in Golestan province. Therefore, amount of feed water changes amount of milk water, that amount of milk water is high than hot and arid regions.

Amount of milk fat is varies from 6.2% to 5.5% that is directly related to nutrition management, amount of drought and climate. The results show a relatively balanced nutrition and management.

Amount of milk protein is varies from 2% to 5.5% and total amount of camel milk protein is like cow's milk (Yasin and Wahid, 1957).

Protein content of camel milk is very low in the dry areas; this case shows that water has a direct effect on milk composition (Yagil and Etzion, 1985).
Protein content of forage has a direct effect on milk protein.

Total amount of mineral content of milk is ash, this amount is very varies in camel milk and the lowest amount of ash can be seen in dehydrated camel's milk (Yagil and Etzion, 1985).

Chloride is high in camel milk although dehydrated camels milk shows reduce of fat, protein and lactose but sodium and chloride increases (El-bahay, 1962). This result salty taste to milk (Yagil and Etzion, 1985).

It seems to milk of all animals that have four nipples, the compounds are similar (Ohris and Joshi, 1961).

Camel milk is very similar to goat's milk and camel milk is easily comparable to human milk. This shows the importance of camel milk for human nutrition.

All data indicate that camel is produced useful milk for human consumption and fluctuations of fat, protein and salt are directly related to amount of water consumption and changes in pasture.

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