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CHEMICAL AND AMINO ACID COMPOSITION OF CAMEL MILK

Fermentative treatment of camel milk is a part of ethnic traditions of Central Asia people. In Mongolian fermented camel milk is called khoormog. Present study was carried out chemical composition of camel milk and khoormog. Chemical compound of camel milk is remarkably different from cow and other milks. Fat consist in Mongolian camel milk is 4.56 % in average with ranges 2.5–8 % dependently on season and camel species. High fat concentration gives tender smooth consistent and specific taste. Results showed that 11.0 % total solids, 4.09 % protein, 1.27 % ash, and a pH of 6.0. Also an experiment was carried out to determine the amino acids of camel milk protein There were noticeably higher levels of tyrosine, histidine, phenylalanine and methionine, respectively, while a lower values of glycine and asparagine in camel milk.

Key words: *khoormog, protein, fat, amino acids.*

Introduction

Out of 25.89 million camel populations on the world 89 % are one-humped camels and the remaining 11 % are the two-humped. More than 60 % of the dromedary camel population is concentrated in the arid areas of North East African countries [1]. Camel milk, white gold of the desert is more similar to human milk. It differs from other mammals milk as its chemical composition is low cholesterol, low sugar, high minerals, high vitamin C and higher protective proteins like lactoferrin, lactoperoxidase, immunoglobulins and lysozyme, lacks B-lactoglobulin. β-lactoglobulin camel milk is unique in terms of antioxidative factors, antibacterial, antiviral, antifungal, anti-hepatitis, anti-arthritis, treatment for paratuberculosis, preventies aging, remedy for autoimmune diseases and it has cosmetic values [2]. Although camel milk has such values, it's less appreciated thus its consumption is restricted to pastoral area so further studies should be conducted on the chemical composition and medicinal value of camel milk.

Camel's milk is generally an opaque white color and has a faint sweetish odor and sharp taste; sometimes it can be salty (Abbas, 2013). Its opaque white color because of the fats are finely homogenized throughout the milk whereas, the changes in taste are caused by the type of fodder and availability of drinking water [2]. Its density ranges from 1.026–1.035 and the pH from 6.2–6.5, both are lower than those of the cow's milk and maximum buffering capacity of skim milk is at pH 4.95 [3].

According to most authors the composition of camel milk varies due to difference of geographical origin and year of publication of the published datas but other factors such as the physiological stage, feeding conditions, seasonal or physiological variations, genetic or health status of camel have also a paramount importance [4].

Materials & methods

Collection of samples

Camel's milk and khoormog samples were collected from Dundgobi province in Mongolia. Samples collected were immediately refrigerated. Analyses for pH, acidity and lactose were done within 24 hr of collection. The rest of the samples were freeze-dried and stored under refrigeration for further analyses.

Chemical composition Proximate analysis, acidity were determined according to procedures outlined in AOAC (1980). All minerals were determined with an atomic absorption spectrophotometer (FRC-WI-ChemS-MA28). Amino acid analysis Freeze-dried samples in duplicate were hydrolyzed with 6N HCl for 24 hr at 110°C (Moore and Stein. 1963). The hydrolysates were analyzed on ARACUS ion exchange chromatography.

Result and discussion

Chemical composition Table 1 represents results of the physicochemical analyses of camel milk and khoormog. Average value for pH of the milk at 25°C was 6.0. This was slightly lower than that of reported by other researcher's data to be 6.5. This experiment proved that the protein content of the khoormog and milk protein is close to the published review (Table 1). Also, the fat content of camel milk was 4.56 %, but after fermentation, the fat content decreased to 2.9 %. The ash content of the milk (1.27 %) was relatively higher than mean values reported for other camel milks.

Table1

Chemical and biochemical composition of camel milk and khoormog

Composition	Camel's milk		Khoormog	
	Experiment	Review	Experiment	Review
SNF*, %	11.0 ± 1.0	14.0 ± 2.0	10.0 ± 1.0	12.0 ± 3.0
Protein, %	4.09 ± 0.28	3.9 ± 1.00	2.9 ± 0.02	2.9 ± 0.1
Fat, %	4.56 ± 0.1	5.4 ± 0.9	2.95 ± 0.09	4.00 ± 1.0
Minerals, %	1.27 ± 0.02	0.83 ± 0.3	1.29 ± 0.02	0.7 ± 0.12
pH	6.0	6.5	4.0	3.9
Titratable acid, T°	69.0 ± 1.0	20.15 ± 0.28	123 ± 1.0	120 ± 1.0
Density, g/cm^3	1.020 ± 0.01	1.032 ± 0.01	1.030 ± 0.01	1.012 ± 0.01

* *Solids non-fat.*

The principal milk proteins such as casein and whey proteins constitute a favorable balance of amino acids, comprised essential and non-essential amino acids in varying concentrations. In the experiment, 13 amino acids were found in camel's milk, than 7 essential and 2 semi-essential amino acids were detected by ion exchange chromatography.

Table2

Amino acid composition of camel's milk and khoormog

Content of amino acids, mg/100g	Camel's milk	Khoormog
Isoleucine	3.43	8.78
Leucine	3.85	9.76
Lysine	1.57	7.00
Methionine	5.50	15.67
Phenylalanine	6.38	18.64
Threonine	2.99	9.03
Histidine	6.83	21.56
Glutamine	2.98	11.87
Glycine	0.35	2.26
Serine	1.12	5.14
Tyrosine	7.26	23.19
Arginine	2.45	–
Asparagine	–	4.82

The present study revealed that tyrosine was the major amino acid in casein while histidine was second among essential amino acids as shown in Table 2.

Conclusion

On the basis of the above experiments, it is concluded that, the increase in the content of amino acids is explained by the breakdown of proteins into peptides and free amino acids during the fermentation.

This study has been proven that the fat content is reduced during the fermentation. It has been reported that it is difficult to extract the fat by the traditional method of churning sour milk due to firm bonds between the fat and protein of milk (Khan and Appanna, 1967).

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ХИМИЧЕСКИЙ И АМИНОКИСЛОТНЫЙ СОСТАВ ВЕРБЛЮЖЬЕГО МОЛОКА

Ферментативная обработка верблюжьего молока – часть этнических традиций народов Средней Азии. По-монгольски ферментированное верблюжье молоко называется хормог. В настоящем исследовании был проведен химический состав верблюжьего молока и хормога. Химический состав верблюжьего молока заметно отличается от коровьего и других видов молока. Содержание жира в монгольском верблюжьем молоке составляет в среднем 4,56 % с диапазоном 2,5–8 % в зависимости от сезона и породы верблюда. Высокая концентрация жира придает нежный, ровный, стойкий и специфический вкус. Результаты показали общее содержание твердых веществ 11,0 %, белка 4,09 %, золы 1,27 % и pH 6,0. Также был проведен эксперимент по определению аминокислот в белке верблюжьего молока. В верблюжьем молоке были заметно более высокие уровни тирозина, гистидина, фенилаланина и метионина соответственно, при более низких значениях глицина и аспарагина.

Ключевые слова: *хормог, белок, жир, аминокислоты.*