



Short Communication

Composition of Mauritanian Camel Milk: Results of First Study

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ABSTRACT

We report here the results of a preliminary study aimed to determine the chemical composition of the raw Mauritanian camel milk. The mean values of the main components monitored were: fat ($2.92 \pm 0.59\%$); proteins ($2.50 \pm 0.10\%$); lactose ($4.91 \pm 0.61\%$); minerals ($1.30 \pm 0.09\%$), water (88.20 ± 2.01) and acidity ($16.1 \pm 1.2D^\circ$). Although slightly different from some of the data reported worldwide, these values are very similar to those found in our region. This study clearly demonstrates that Mauritanian camel milk could provide a valuable energy source in the diet of the urban consumer as it has been for decades for the Bedouin population. © 2011 Friends Science Publishers

Key Words: Camel; Milk; Composition; Mauritania

INTRODUCTION

The world one-humped dromedary population is confined in the semi-arid and desert belt of Africa and Asia. Unlike the two-bumped camel (Bactriane) more adapted to the cold and localized in narrow zone from Turkey to China, the dromedary is much fitter in hot areas and is indexed in 35 countries stretching from Mauritania to India (Mehaia *et al.*, 1995).

Camel has always been praised by the Bedouins in the whole Sahara not only for its food-producing potential but also as the only transportation mean to move across the arid and vast desert. As a result, camel ownership was a major criterion in the social and economic standing among pastoral societies. Camel milk is highly nutritious so much so that many generations of our ancestors survived on this beverage alone. As for many others female mammals, camel milk is almost a complete food consisting of proteins (mainly casein), fat, salts and milk sugar (lactose) as well as vitamins and minerals (Sawaya *et al.*, 1984). It is estimated that 1603000 dromedary camels live in Mauritania (Aziz & Mohamed, 2005; Ahmad *et al.*, 2010). The two main breeds (*Reguibi* in the north & *Berabich* in center & the south) are both used for their meat and milk.

Although camel milk production in Mauriatnia is still essentially following the old un-organised nomadic style, efforts are now focused on applying modern techniques in the production, transformation and marketing of camel milk in our country. Camel dairies have been founded and their products such as milk, cream, yogurt and more recently a soft cheese called 'camelbert' are readily available on the local market. However, there is no published data on the

composition and yield of camel milk in our country. This preliminary study was aimed to provide the main physico-chemical parameters of the Mauritanian camel milk.

MATERIALS AND METHODS

Animal and samples collection: Thirty six dromedary females at various stages of lactation were selected from two herds feeding on natural grazing in the northern region of the country. Each herd included the two main breeds *Reguibi* and *brabiche*. Raw milk samples (0.5 L each) were collected at milking time in a clean and dry container. The samples were kept in ice and transported to the laboratory, where they are stored at 4°C.

Analysis: The acidity test, based on the Dornic method was performed upon arrival to the laboratory using AOAC procedures (Fabro *et al.*, 2006). The others analysis were carried out within the next 48 h. In the density determination we used a commercial LACTAN-4 thermolactodensimeter. Nitrogen content was determined by the kjedahl method (Lynch & Barbano, 1999) using a conversion factor of 6.38 to calculate the milk protein content. Fat percentage determination was performed with a Gerber butyrometer (Kleyn *et al.*, 2001). Total solids were measured by gravimetric technique after drying the samples in oven until the weight remained constant (Bremmer *et al.*, 1997). Ash content and mineral composition determination was carried out as described following AOAC procedures (Cook, 1997).

Statistical analysis: The data were analyzed using computer package R, release 4.0B, date of release June 1998.

RESULTS AND DISCUSSION

The values of the main components of Mauritanian camel milk are presented in Table I. Measuring the acidity is an important test used to determine milk quality (AOAC, 1990). This measurement is also used to monitor processes such as cheese and yogurt making. In our study we found that the acidity mean value was $16.1 \pm 1.2^\circ\text{D}$. Twenty five out of the 36 samples tested have acidity between 15 and 16°D . In the absence of Mauritanian reference, we compared our results with the Spanish cow's milk standards (Soler *et al.*, 1995), which consider acidity between 14 and 18°D as a sign of good quality milk. This milk is widely used in many countries. The percentage of fat in camel milk obtained in this study ($2.92 \pm 0.59\%$) falls just within the range of 2.90 to 5.40% often quoted in the literature (Farah & Fischer, 2004). This low percentage is certainly due to a dietary difference reflecting the desert nature of our country. It indeed is closer to the values of 2.65% and 3% obtained respectively from Moroccan (Kouniba *et al.*, 2005) and Tunisian (El-Hatmi *et al.*, 2006) studies on camel milk. In these two countries, the dromedaries live on pastures similar to our vegetation.

Proteins represent one of the greatest contributions of milk to the human nutrition (Basnet *et al.*, 2010). The content of proteins in our samples showed an average of $2.50 \pm 0.10\%$. Here also, the value is below the mean of 3 to 3.9% reported in many camel milk studies (Yagil & Etzion, 1980; Knoess, 1982) but similar to regions where water is scarce (Elamin & Wilcox, 1992).

Lactose is the major carbohydrate in milk. Content of lactose in our study gave an average of $4.91 \pm 0.70\%$ with a distribution pick around 5%, which is within the interval of the world mean values of 4.8 to 5.8%. Without water, milk would be a viscous secretion composed mostly of lipids and proteins and would be extremely difficult to remove from the gland.

Our study showed an average humidity of 88.20 ± 2.01 . The analysis of the histogram of the values gave a very little variability in the water content with a maximum around 88%. This level is also close to the value reported in similar climatic conditions (Yagil & Etzion, 1980; Elamin & Wilcox, 1992). The high water percentage as well as the lower density of camel milk compared to the cow's milk is the reason for which Bedouins use camel milk not only as nutritious food but especially as a substitute to an almost non-existent water.

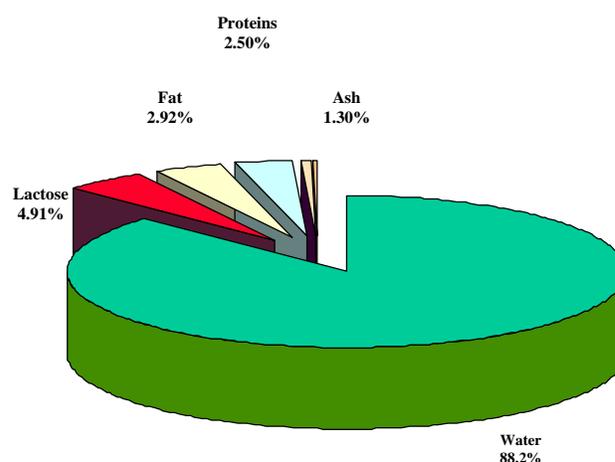
Milk minerals have many roles in the body including bone formation, water balance maintenance and oxygen transport (Brody, 1999). Our average value of ash ($1.30 \pm 0.09\%$) and mineral composition (Fig. 1) are higher than most of the data reported (Elamin & Wilcox, 1992; Konuspayeva, 2007). Reason of this increase is still unclear to us but one cause could be a traditional practice in the country, which is giving natural solid salt (Amerssal) to the dromedary herds at a fixed period every year.

Table I: Physico-chemical and mineral composition of Mauritanian camel milk. Samples are collected randomly and analyzed with the next 48 h of collection

Characteristics	Mean	SD	Min	Max
Physico-chemical				
Acidity (D°)	16.1	1.20	13.5	18.0
Density (A)*	31.1	1.70	28.6	34.0
Fat (%)	2.92	0.59	1.60	5.20
Protein (%)	2.50	0.10	1.38	3.90
Lactose (%)	4.91	0.61	2.80	6.30
Water (%)	88.20	2.01	84.24	91.3
Ash (%)	1.30	0.09	0.39	3.80
Mineral				
Fe (mg/L)	1.20	0.22	0.55	3.00
Na (g/L)	1.15	0.16	0.9	1.50
K (g/L)	2.70	0.80	1.8	4.10
Ca (g/L)	0.52	0.13	0.36	0.84
Mg (g/L)	0.12	0.01	0.024	0.36

*1,0301 g/cm³ = 30,1 A

Fig. 1: Total composition of Mauritanian camel milk



CONCLUSION

This study provides novel information on the physicochemical parameters of the camel milk in Mauritania. It will allow therefore, filling an important gap by providing bibliographical sources on the total composition of the camel milk in our country. A more extensive study involving a larger number of dromedaries but also considering the interaction of others factors such as specie, environment conditions and the stage of lactation are currently underway.

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