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Research Article

Effect of Parity on Camel Milk composition under Traditional Pastoral and Farmed Systems in Sudan

A.B. Mustafa, A.B[1], E.H.A. Mohamed[2]*, E. Haroun[3], K.A.Attia[4], M.A Nikhala[5]

[1]University of Bahri, PO Box 1660, Khartoum, Sudan.

[2]Natural Hstory Museum, Faculty of Science, Universty of Khartoum,

PO Box 321, Khartoum, Sudan.

[3]Ministry of Animal Resources and Fisheries, West Darfur State, Sudan.

[4]Department of Animal Nutrition, Faculty of Animal Production, University of Khartoum,

PO Box 321, Khartoum, Sudan.

[5]Department of Diary Production, Faculty of Animal Production, University of Khartoum,

PO Box 321. Khartoum. Sudan.

ABSTRACT

The composition (solid non-fat, crude fat, crude protein and lactose) was determined in milk from lactating camel (*Camelus dromedarus,* one humped), under traditional pastoral and farming system, and compared in five parities by automatic milk analyzer lactoscan. Milk density and temperature and caloric values were also recorded. The mean values reported were: Solid non-fat (9.13 and 8.42%); crude fat (5.39 and 1.71%); crude protein (4.94 and 4.57%); lactose (3.64 and 3.24%). The range of caloric value was (59.6 to 92.7 and 32 to 38.4 cal/g) and of density (29.57 to 34.43 and 27.67 to 33.15%) for traditional pastoral and farming system, respectively. A slight reduction in protein content in advance parity of both systems was observed. More reduction (10.78%) was observed in protein content of mixed camel milk of the five parities from traditional pasture compared (7.96%) from farming system. More reduction in energy content (16.68% and 35.69%) was observed in the 5th parity of both traditional pasture and farming system, respectively, compared to the 1st parity, but less energy was lost in the milk of the five parities. A strong positive correlation (r=1) was found between all milk components of camel from traditional pasture. Weak correlation was observed between CF and density (r = 0.34) and CF and CP (r = 0.45) in farming system. The results of the present study indicated that camel milk can provide various potential health benefits, but mixed milk from the five parities of both herds can provide better nutritive milk compared to a single parity. However, more work is needed to study the effects of breed differences and seasonal changes on milk composition.

Keywords: Camel milk, *Camelus dromedarus*, density, energy, fat, lactose, parity, SNF, protein.

INTRODUCTION

Camel milk has an important role in human nutrition in the hot regions and arid countries. Camel milk contains all the essential nutrients found in bovine milk [1, 2; 3; 4]. Fresh and fermented camel milks have been used in different regions in the world including Sudan as a treatment for a series of diseases such as dropsy, jaundice, tuberculosis, asthma and leishmaniasis or kala-azar

[5]. Recently, camel milk was also reported to have other potential therapeutic properties, such as anti-carcinogenic [6], anti-diabetic [7] and anti-hypertensive [8], and has been recommended to be consumed by children who are allergic to bovine milk [9].

Globally camel produces about 2 % of the world total milk and that milk is mostly produced by pastoral people and consumed locally. Camel milk is now used in the modern urban masses and found in the shelf of the super markets and shopping malls in the form of plain and flavored milk, cheese and chocolate. The camel sustains its productivity in difficult conditions and comparatively lesser affected by the adverse factors like lack of feed, water, season and length of lactation. However, some factors such as type of food, age and parity are expected to affect the quality and composition of camel milk [10; 11; 12; 13; 14]. Geographical origin and seasonal variations were found to be the most effective factors in camel milk composition (Konuspayeva et al., 2009[15].

The Camel (*Camelus dromedaries*, one humped) milk is a very important resource of milk for humans in several arid and semiarid regions of Sudan, where it represents the only protein source. Now camels are raised under farming systems in Sudan to improve the suitability of raw milk through adjustment of feed composition. Farming system is expected to improve the quality of camel milk and increase the yield. Very rare references are available [3; 13] on various quantitative traits of milk from different parities and under different productive systems. Therefore, the present study is an attempt to reveal and compare the effect of various parities in the quality of milk from camel under traditional pastoral and farming systems. The aim of the work was to know and exploit the true potential of camel milk at different parities and productive systems to find better ways of sustaining this old industry for the conservation of important animal resource in the near future. The variation provided can be used successfully in the future strategies of the milk yield and improvement.

MATERIAL AND METHODS

Study area and animals,

The study was conducted on 46 lactating camels aged 7-13 years (23 camels from a traditional pastoral herd and 23 camels from a dairy farming system in Khartoum North during the dry season. The dominant vegetations of the natural pasture are *Acacia tortilis, Maeura crassifolia, leptodania pyrotechnica* and *Acacia seyal*. The diet of the farming system composed of ground nut cake and molasses-based diet plus good water supply. Camels ranging from primiparous to camels in their 5th parity, were selected from each of the two herds for this study.

Collection of milk samples,

Samples of milk (40ml) were collected from each lactating "*Naga*" early morning at milking time (8:00) in clean glass bottles, thoroughly mixed and immediately transferred to the laboratory for analysis at room temperature. All samples of the two groups came from herd and same parity. Milk samples of the same parity in the two groups were collected every week to get a strictly 7-day interval.

Chemical and statistical analysis,

The chemical components of camel milk, solid non-fat (SNF), crude fat (CF), crude protein (CP) and lactose were determined weekly after parturition by automatic milk analyzer device (Lactosan MCC), calibrated for camel milk. Density and temperature of milk were also reported. Gross energy was obtained for each parity.

Data was statistically analyzed using STATISTIX software (Version, 10). Mean and standard deviation (SD) were reported weekly and correlations between the different components of the milk in different parities of each raising system were calculated.

RESULTS AND DISCUSSION

The present investigation was carried out to study changes milk composition of camels from traditional pasture and farming system at different parities. As shown in Tables (1), the density of camel milk from five parities of each traditional pasture and farming system herds is not significantly different ($p>0.05$). Solid non-fat differ significantly ($p<0.05$), while the difference in fat content was highly significant ($p<0.01$) and lactose level was almost same in the two herds. In comparing the levels of milk constituents in the five parities a clear reduction was observed in most of milk constituents from the first to fifth parity in both herds (Figure 1 & 2). Camel milk from traditional pasture provides more energy compared to farming system (Figure 3).

The content of SNF in camel milk decreased from 1st to advance parity in both traditional pasture and farming system (Table 2), but more reduction (11.70%) was observed in mixed milk of traditional pasture than (8.68%) of farming system. The fat content of camel milk under traditional pasture was very high (4.41 and 7.58%) compared to (1.36 and 2.04%) of camel milk under farming system. The fat content of traditional pasture decreased significantly with advancing parity, while parity has

no effect in case of farming system. A reduction of (31.66%) in fat content was found in the 3rd parity and (41.82%) in the 5th parity compared to the first parity (Table 2) in milk of traditional pasture, while the reduction was (19.59%) and (15.98%) in the same parities, respectively, of camel milk from farming system. However, less reduction 28.89% and 11.86% was observed for the two raising systems, respectively, when the milk of the five parities was mixed (Figure 4). Crude protein content of camel milk under traditional pasture ranged from (3.34% to 4.08%) and the average of the 5 parities was (3.64 ± 0.28%), while it ranged from (2.92% to 3.52%) with (3.24 ± 0.21%) in camel milk under farming system. As can be observed there was no significant difference in protein content of camel milk from the two raising systems and there was a slight reduction in protein content in advance parity of both systems. More reduction (10.78%) was observed in protein content of mixed camel milk from traditional pasture compared (7.96%) from farming system. More reduction in energy content was observed in the 5th parity of both raising systems compared to the 1st parity (Table 2), but when the milk of the five parities is mixed less energy will be lost. The results of the present study indicated that mixed camel milk from the five parities of both herds can provide better nutritive milk compared to a single parity (Figure 5) .A strong positive correlation (r=1) was found between all milk components (Density, NSF, CF, CP, L and energy) of camel from traditional pasture, while the in farming system weak correlation was observed between CF and density (r = 0.34) and CF and CP (r = 0.45).

The composition of camel milk reported in this study was comparable to the findings of reported by many authors [4; 15; 16] with slight variations. However, the contents of fat and lactose recorded in this study are higher compared to studies carried by [3; 12; 13] on other breeds in Sudan The variation in levels of milk composition could be due to difference in breeds and geographic locality, the type of plants eaten in the pasture, age, number of calves and lactation period [10; 11; 17; 18; 19; 20; 21] and plant feed in the farming system. Our results agreed with [22]. who found significant difference in fat and protein of camel milk in Ethiopa between different parities, but disagree with [4; 23] who reported negative correlation between lactose, protein and milk fat contents with advancing lactation and parity, although we observed significant reduction in crude fat, SNF and energy with advancing parities.

CONCLUSION

The composition of camel milk varies with quality and availability of feed as well as parity differences. Camel milk is important source of diet especially for migratory pastoral societies in dry regions of Sudan. About 3.724 million herds of camels are raised in Sudan [24]. by traditional pastoralist in arid and semi-arid regions and some herds are domesticated under farming system with special management and feeding conditions. According to the present results it seems that traditional pastoral system can provide milk with better nutritional contents compared to the farming system. This could be explained by the fact that natural pasture is more variable in plants and vegetations and provides many varieties preferred by the camels. In addition, camels are physiological the metabolically adapted to certain types of vegetations than the commercial feed provided in the farm management system. However, interventions to improve the production practices through better hygiene and medical diagnosis of camels and their milk is needed.

Table 1. The composition of camel milk (%) and gross energy (cal/g) of five parities from traditional pasture and farming systems.

	Parity	No of camels	Density %	SNF%	CF%	CP%	Lactose%	Gross energy Cal/g
Traditional pasture	1	4	34.43	10.34	7.58	4.08	5.42	92.72
	2	3	32.67	9.47	5.33	3.71	5.14	70.64
	3	8	32.66	9.47	5.18	3.7	5.02	68.76
	4	6	30.02	8.64	4.45	3.38	4.6	60.25
	5	2	29.57	8.55	4.41	3.34	4.54	59.63
M ± SD			31.87 ± 1.81	9.13 ± 0.69	5.39 ± 1.35	3.64 ± 0.28	4.94 ± 0.34	70.4 ± 13.4
Farming system	1	3	33.15	9.22	1.94	3.52	4.97	38.42
	2	2	30.98	8.54	2.04	3.28	4.6	37.83
	3	3	31.21	8.35	1.56	3.26	4.62	33.45
	4	3	30.91	8.41	1.36	3.22	4.55	32.30
	5	2	27.67	7.59	1.63	2.92	4.11	32.01
M ± SD			30.78 ± 1.97	8.42 ± 0.58	1.71 ± 0.28	3.24 ± 0.21	4.57 ± 0.31	34.8 ± 3.1

Table 2. Percentage reduction of milk constituents in 3rd parity, 5th parity and mixed milk compared to first parity.

	Parity	Density%	SNF%	CF%	CP%	Energy%
Traditional pasture	3rd parity	3.06	8.41	31.66	9.31	25.84
	5th parity	14.12	17.31	41.82	18.14	35.69
	Mixed milk	7.44	11.70	28.89	10.78	24.07
Farming system	3rd parity	5.85	9.44	19.59	7.39	12.93
	5th parity	16.53	17.68	15.98	17.05	16.68
	Mixed milk	7.15	8.68	11.86	7.96	9.41

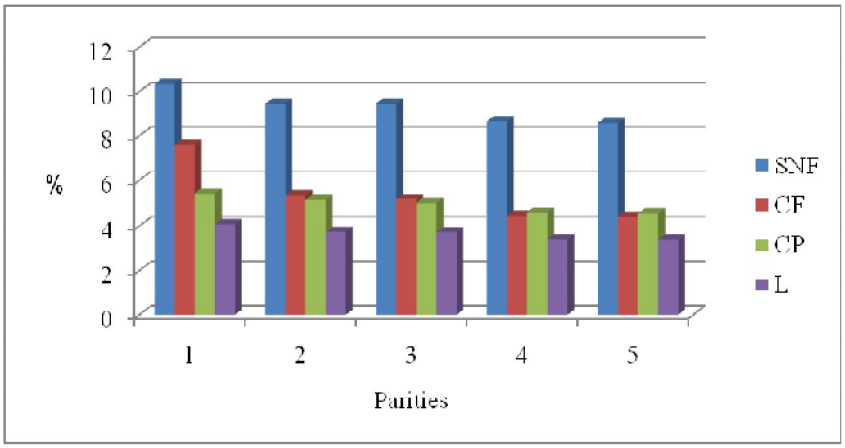

Figure 1. The composition (%) of milk in five parities of camels under traditional pastoral system.

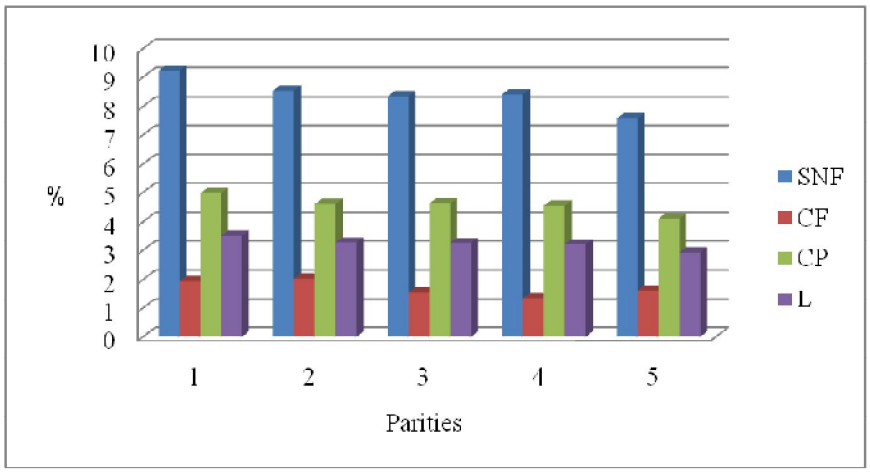

Figure 2. The composition (%) of milk in five parities of camels under farming system.

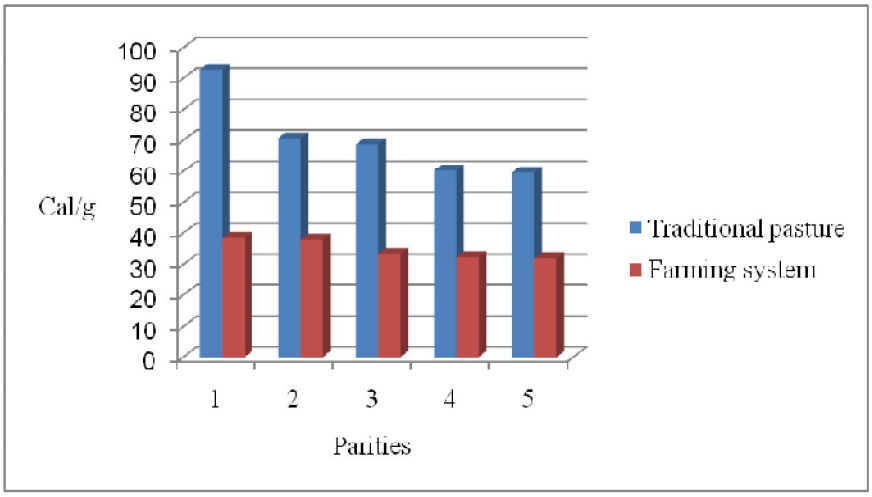

Figure 3. Gross energy (cal/g) of milk in five parities of camels under traditional pastoral system and farming system.

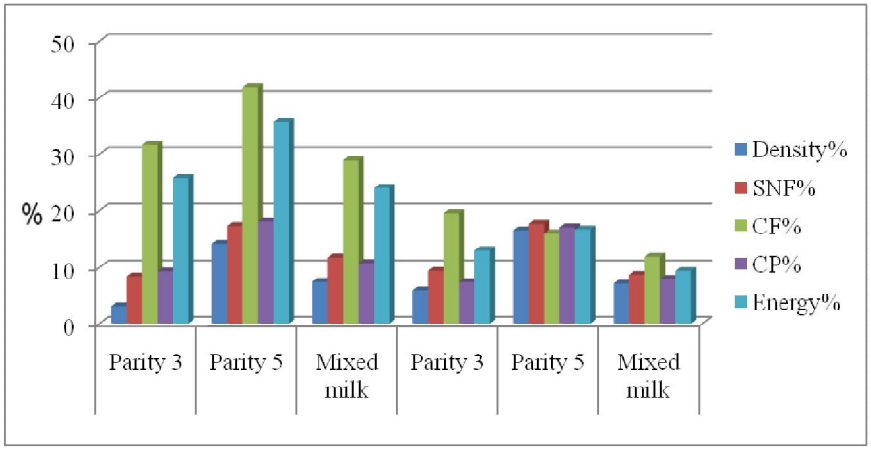

Figure 4. Percentage loss in composition of camel milk from traditional pasture and farming system in 3rd and 5th parities and mixed milk.

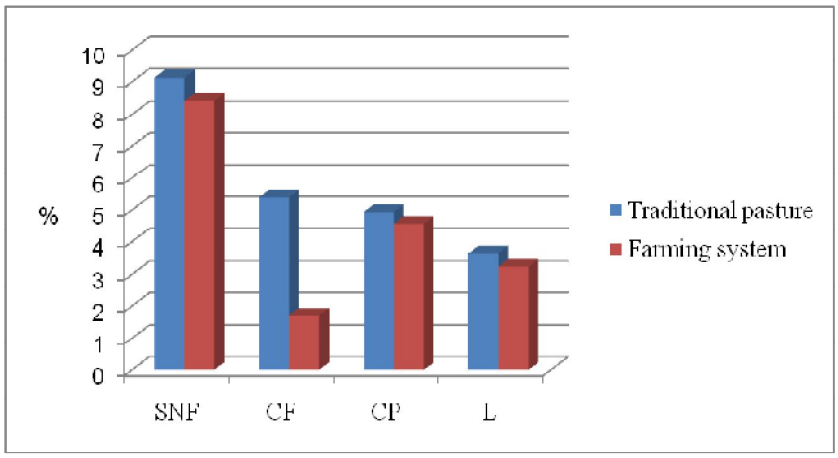

Figure 5. The composition (%) of mixed milk from five parities of camel under traditional pastoral system and farming system.

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