



The Effect of Parity Number on Chemical Composition of Camel Milk under Open Range System in Nyala area (South Darfur, Sudan)

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ABSTRACT

This study was designed to investigate the effect of parity number on chemical composition of dromedary camel milk under open range system in Nyala area (South Darfur, Sudan). Milk samples (N=64) were obtained from lactating she camels after parity number one through six (n=9, 20, 19, 4, 5 and 7, respectively). Chemical constituents of milk including fat, Solids Not Fat (SNF), lactose and protein were determined. Significant ($p \leq 0.05$) variations between different parities were obtained for all measured constituents. Milk fat and SNF contents were more influenced by number of parity compared to protein and lactose. The mean value (mean \pm SE) of fat content tends to decrease in the next parity. It decreased gradually from 4.90 \pm 0.22% in parity number one to 2.21 \pm 0.25% in parity number six. Controversy, mean SNF content tends to increase in the next parity. It increased from 8.15 \pm 0.10% to 9.51 \pm 0.18% in parity number one and six, respectively. Lactose content was slightly increased from 4.59 \pm 0.10% to 5.19 \pm 0.16% in first and fourth parity, respectively. Then it decreased to 4.77 \pm 0.12% in parity number six. Similar profile was obtained for protein content. It increased from 3.58 \pm 0.07% in first parity to 3.82 \pm 0.10% in parity number four, and then decreased to 3.62 \pm 0.085 in parity number six. It could be concluded that number of parity has significant influence on the compositional quality of dromedary camel milk reared under open range system.

Keywords: Camel Milk, Chemical Composition, Parity number

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INTRODUCTION

According to the most recent national and international reports, camel population in Sudan estimated at about 4.75 million head (FAO, 2013). This number is mainly occupied the western region of the country, namely, Kordofan and Darfur, where 62% (2.96 million head) of the national camel population is found. According to the

report of the Sudanese Ministry of Animal Resources and Fisheries, Darfur alone holds 1.18 million head which represents 25% of the camel population in the country (MARF, 2012). The Ministry of Livestock Resources and Fisheries and Pasture (South Darfur State) in a recent report estimated camel population in the state

at about one hundred thousand head (MLRFPSD, 2014).

Like elsewhere in Sudan, camel ownership in Darfur is built on tribal base. Tribes of Arabic origin in the region such as *Maalia*, *Rizigat*, *Mahria*, *UmmJallol*, *Awlad Zaid* and *Bani Halba* are famous for rearing camel. Moreover, other tribes like *Midob* and *Zaghwa* are also owned numerous camel populations (Musa *et al.*, 2006). Tribes famous for keeping camels are locally known as *abbala*. They are mainly rearing camels under tradition nomadic production system in open range lands.

For communities of *abbala*, camel is the symbol of survive under the poor desert and semi desert environmental condition. In such environment, camel biological products including milk, meat and hair are of very important value. Among the other products, camel milk comes first in term of nutritional importance. As it is the main source of protein, in addition to being the main table diet throughout the year (Shueip *et al.*, 2014 and Zeleke, 2007).

Because of its improtent role for camel herder communities, the chemical composition of camel milk has been widely investigated by several researchers worldwide. These studies have been reviewed and summarized by Al Haj and Al Kanhal (2010) and Konuspayeva *et al.* (2009). The results showed wide range of variations among different milk constituents. These variations were mainly attributed to physiological status of she camels, genetic background and management and feeding systems (Khaskheli *et al.*, 2005 and Musaad *et al.*, 2013).

No quantitative variations were taken in consideration regarding consumption of camel milk in the regin of Darfur. In field application, *abbala* doesn't practice culling on base of

either age or number of kidding, although, in their local literature *abbala* preferes milk of first parity and it is more acknowledged. Nevertheless, very rare references are available on various quantitative traits of milk in relation to different parities in the region of Darfur. Hence, the present study was designed to investigate the chemical composition and to evaluate the influence of number of parity on compositional quality of dromedary camel milk under open range system in the region.

MATERIALS AND METHODS

Area of the study and animals: The current study was carried out around Nyala city (latitude 12.05° N and longitude 24.89° E), the capital of South Darfur State (latitude 8.30°-13.13° N, and longitude 23.15°- 27° E). Lactating she camels (N=64) in fifteen nomadic camel herds afte their first (n=9), second (n=20), third (n=19), fourth (n=4), fifth (n=5) or sixth (n=7) parities were subjected to sampling.

Including and excluding criteria: Due to the lack of records, she camel was only considered for sampling when the herder is sure about the number of the current parity, when he was unsure or hesitated, she camel was then excluded.

Collection of milk samples: After complete hand milking of individual she camels and thoroughly mixing of milk, whole milk samples of about fifty ml were collected in clean plastic containers. Samples were immediately labeled and transported under cooling to the laboratory within 1 to 3 hours.

Chemical investigation: The LactoScan Milk Analyzer (Milkotronic LTD, Europe) was used to determine the quantities (%) of fat, Solids Not Fat (SNF), lactose and protein in dromedary camel milk samples. Each sample was measured twice, and the mean value was considered.

Statistical analysis: Analysis of variance using univariate general linear model with source of variation including six levels was performed. Duncan multiple range test was used for separation of means. Statistical Package for Social Sciences (SPSS v.13) was used to run the statistical analysis.

RESULTS AND DISCUSSION

This study was designed to investigate the compositional quality of dromedary camel milk under open range system in Nyala area (South Darfur, Sudan), and to evaluate the effect of number of parity on milk constituents. The values of chemical constituents (mean \pm SE) of she camel milk including fat, SNF, lactose and protein after parity one through six, are shown in Table 1.

The mean chemical constituents of dromedary camel milk obtained in this study were in the ranges of those reviewed by (Al Haj and Al Kanhal, 2010 and Konuspayeva *et al.*, 2009). The results also revealed significant ($p \leq 0.05$) variations in milk constituents between different parities. This result

is in agreement with El Amin *et al.* (2006). However, it is in disagreement with Babiker and El Zubeir (2014), who reported non-significant ($p \geq 0.05$) variations between parities, although, they reported quantitative variation.

The fat content in this study was in range from 2.21 ± 0.25 to $4.90 \pm 0.22\%$. These values were detected in parity number one and six, respectively (Table 1). The mean fat content obtained in this study was within the range of those reported by Khaskheli *et al.* (2005) and Konuspayeva *et al.* (2009). Parity number one revealed significantly ($p \leq 0.05$) higher mean fat content. This result is in agreement with Dowelmadina *et al.* (2014). However, our result was not in line with that reported by Babiker and El Zubeir (2014). That could be attributed to different management system which indicates different feeding regime. Moreover, it could also be due to different stage of lactation. Nagy *et al.* (2013) concluded that the fat content of dromedary camel milk is highly influenced by the stage of lactation.

Table 1: Effect of number of parity on chemical constituents of camel milk under open range system in south Darfur (Sudan)

Parity No	No of samples	Chemical constituents of camel milk (mean \pm SE)			
		Protein (%)	Lactose (%)	Fat (%)	SNF (%)
1	9	3.58 ± 0.07^b	4.59 ± 0.10^b	4.90 ± 0.22^a	8.15 ± 0.16^b
2	20	3.48 ± 0.04^b	4.67 ± 0.07^b	4.29 ± 0.15^b	8.93 ± 0.11^{ab}
3	19	3.56 ± 0.05^b	4.81 ± 0.07^b	4.22 ± 0.15^b	9.15 ± 0.11^{ab}
4	4	3.82 ± 0.10^a	5.19 ± 0.16^a	2.52 ± 0.33^c	9.51 ± 0.24^a
5	5	3.44 ± 0.09^b	4.73 ± 0.14^b	2.64 ± 0.30^c	9.20 ± 0.22^{ab}
6	7	3.62 ± 0.08^{ab}	4.77 ± 0.12^b	2.21 ± 0.25^c	9.51 ± 0.18^a
Total	64	3.58 ± 0.03	4.80 ± 0.05	3.47 ± 0.10	9.08 ± 0.07

Different superscripts within same column indicate significant difference ($p \leq 0.05$).

The content of SNF in camel milk was ranged from 8.15 ± 0.16 to $9.51 \pm 0.24\%$. The highest value was detected in parity number four and six, while the lowest value was in parity number one (Table 1). The result obtained in this study was similar to that reported by Dowelmadina *et al.* (2014) and

Mustafa *et al.* (2014). However, it was slightly higher than that of Babiker and El Zubeir (2014). The profile of SNF showed a general increase up in the next parity from first up to fourth parity (from 8.15 ± 0.16 to $9.51 \pm 0.24\%$), and then slightly decreased to $9.20 \pm 0.22\%$ in parity

number five. Similar pattern but up to parity number five was also reported by Babiker and El Zubeir (2014).

The mean lactose content in this study was $4.80 \pm 0.05\%$ (Table 1). This result is lower than the result reported by Riyadh *et al.* (2012). It is however, similar to that reported by Dowelmadina *et al.* (2014). Moreover, it is slightly higher than that reported Shueip *et al.* (2014). In this study, the mean lactose content found to increase, with no significant variation between parities, from $4.59 \pm 0.10\%$ to $4.67 \pm 0.07\%$ and then to $4.81 \pm 0.07\%$ in first, second and third parity, respectively. Then parity number four showed the highest significant ($p \leq 0.05$) lactose value ($5.19 \pm 0.16\%$). This result is in disagreement with Zeleke (2007) and Babiker and El Zubeir (2014), they reported highest lactose values in first and fifth parities. Moreover, the significant ($p \leq 0.5$) variations in lactose content after different parity observed in the current study is in disagreement with Yagil and Etzion (1980). They reported that lactose content of camel milk remains unchanged under different circumstances. Our result showed however, significant influence for the number of parity on lactose content in camel milk. In the same context, Konuspayeva *et al.* (2009) concluded that lactose content of camel milk varies from 2.40 to 5.80%. This wide range could be mainly attributed to the type of feeding (Khaskheli *et al.*, 2005).

Protein content was found in range from 3.44 ± 0.09 to $3.82 \pm 0.10\%$. These values were detected in the fifth and fourth parity, respectively. Protein content of camel milk in this study was within the range that reported by Konuspayeva *et al.* (2009) and Mustafa *et al.* (2014). However, it is higher than that reported by Nagy *et al.* (2013). It could be due to the fact that

they studied the chemical constituents of dromedary camel milk under intensive production system. Compared to other constituents, protein is seemed to be less influenced by number of parity. In our result, parity number four revealed the highest significant ($p \leq 0.05$) mean value (Table 1). While no significant ($p \geq 0.05$) variation was detected between other parity. This result is in partial agreement with Babiker and El Zubeir (2014).

Due to the lack of recording system, the current study doesn't take the effect of the stage of lactation into consideration. Nevertheless,

considering this parameter in addition to its interaction with the number of parity might lead to different results.

The conflicting data available about the compositional quality of dromedary camel milk could be due to many reasons, among which production system is well recognized. Nowadays, camel herders are widely shifting from open production system to farming systems targeting the improvement of productivity of camel milk in terms of quantity, quality as well as better marketing opportunities. However, Dowelmadina *et al.* (2014) concluded that camel reared in the traditional nomadic open system had significantly higher contents of milk constituents (namely fat) compared to the intensive farming system. Taking this point into consideration, in addition to the environmental, cultural and social importance of the traditional system, more oriented research towards evaluation, adjustment and improvement of the system is highly needed.

CONCLUSION

It could be concluded that camel milk produced under open range production system is not simply similar. The compositional quality of major chemical constituent of dromedary

camel milk is influenced by number of parity.

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