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Study on Chemical Composition Properties of Raw Camel's Milk Produced in Khartoum State, Sudan

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Abstract

The study was carried out to assess the chemical composition of raw camel's milk produced in Khartoum State, Sudan in summer and winter seasons.

30 samples of the raw camel's milk were taken from five different areas (El _ Sarha , El_ Hatana , Soog Libya , Om Dawn Ban and Shambat) . 15 samples were taken in May , 2017 and 15 samples in February , 2018 . The results obtained in two seasons (summer and winter) ,respectively as the following :-

The results of chemical composition which obtained in summer were pH (5.6 – 6.6) ,density (18 – 29) , fat content (2.3 – 3.5%) , protein content (6.1 – 8.4%) , ash content (0.4 – 0.9%) , lactose content (2.5 – 3.5%) , and total solids (10 . 1 – 14.3%) ,whereas the values of the chemical composition that obtained were (4.6 – 6.6) , (15-29) , (4.5 – 5.0 %) , (2.5 – 3.5%) , (0.7 – 0.8 %) , (4.4 – 5.7%) and (8.2 – 15 .2%) for the above mentioned parameters , respectively.

Key words : Composition properties , Raw camel's milk , Five different areas , Khartoum State , Sudan .

Introduction

Dromedary camels (*Camelus dromedarius*) play an important role as a primary source of subsistence in the Middle , North and East Africa . They live in arid and semi – arid areas , which are not suitable for crop production and where other livestock species hardly thrive . The primary reason for keeping camel's in these area is milk production . through transportation and meat production. in arid and hot environments , camel are the preferred dairy animals and they produce more milk for a longer period of time , even , during the dry season than local cattle ⁽¹⁾. In some areas , the serves of camel's rides and in turn get income . the camel's is also used as a means for transportation and for domestic use such as drawing water from wells , rivers and dams ⁽²⁾.

Camel's milk has been consumed for countries by nomadic people for its nutritional value and medicinal properties . Currently , pasteurized camel's milk is produced and sold countries including Saudi Arabia , United Arab Emirates , Kazakhstan, Mauritania and Algeria^(3,4) . It is considered to have anti – cancer⁽⁵⁾ and anti – diabetic properties^(6,7) . Several studies have been conducted in the world on camel's milk composition , physicochemical characteristics and functionality (Khalil *et al* (2011) ⁽⁸⁾ , Al Haj and AlKanhah (2010) ⁽⁹⁾ and Rahli *et al* (2013) ⁽¹⁰⁾. Camel milk contains high levels of iron and vitamin C ^(11,12).

The high vitamin C content of camel's milk is of significant importance for human health specially in arid and desert environments where green vegetables and fruits are not readily available .

The objective of the present study was to determine the chemical composition of Sudanese raw camel's milk obtained directly from the udder in summer and winter seasons.

Materials and Methods

Sampling :

30 samples of raw camel's milk were collected directly from the udder in different five areas from Khartoum State , Sudan (El_ Sarha, El_ Hatana, Soog Libya, Om _ Dawn Ban and Shambat) . The ages of camels under the study are between 3 years and 12 years. 15 samples were collected on May , 2017 (summer) and 15 samples were collected on February , 2018 (winter). Raw camel's milk samples (250 ml) were collected in sterile screw bottles kept in an iced box . All samples were transported to the central laboratory (Faculty of Agriculture , University of Khartoum , Sudan) . The samples were analyzed for the chemical composition after arriving the laboratory.

Chemical analysis of camel's milk :

The pH of camel's samples were measured , using digital pH meter ⁽¹³⁾ . Sample densities were measured using digital density meter (Mettler Teledo 30 PX, Greifensee, Switzeland). Fat content

was determined by Gerber method (Richardson, 1985)⁽¹³⁾. Proteins were determined by the standard Kieldahl method using AOAC method (1990)⁽¹⁴⁾. The ash content was determined according to Bradley *et al* (1993)⁽¹⁵⁾. Lactose was quantified according to the method outlined in AOAC (2000)⁽¹⁶⁾. Total solids (TS) content was determined according to AOAC (2000)⁽¹⁶⁾.

Results and Discussion

The results of the chemical composition of raw camel's milk produced in Khartoum State, Sudan in summer and winter are presented in (Tables 1,2), respectively.

The pH values ranged from 5.6 to 6.6 and from 4.6 to 6.6 in summer and winter, respectively, which is almost similar to that obtained by Omer and Eltinay (2009)⁽¹⁷⁾ and Bornaz *et al* (2009),⁽¹⁸⁾ they found that the pH of fresh camel's milk is 6.36 in September and 6.49 in February. These values are lower than pH values (6.5___6.7) reported by yagil (1982)⁽¹⁹⁾ for camel milk. However, it is higher than the pH 5.67 reported for raw camel's milk from Algeria⁽²⁰⁾. The density values ranged from 18 ___ 29 and from 15___29 in summer and winter respectively. Camel's milk densities were related to differences in the frequency of camel's watering.⁽¹⁰⁾

Fat content of camel's milk obtained in this study ranged from 2.3 to 3.5% and from 4.5 to 5.0% in summer and winter, respectively. This result is in agreement with those reported by Khaskheli (2005)⁽²¹⁾ who found that the fat content for camel's milk produced in Pakistan was 1.8 to 5.0%. This result is in disagreement with those reported by Alloui ___ Iombarkia *et al* (2007)⁽²²⁾, El_Hatim *et al* (2006)⁽²³⁾ and Kamal *et al* (2007)⁽²⁴⁾, they found that the fat content of Algerian dromedary camel's milk is between 30 g/l and 52.1 g/l in September and February, respectively. Protein content in this study ranged from 6.1 to 8.4% and from 2.5 to 3.5% in summer and winter, respectively, some studies, reported higher value : 3.90% (Dukwal *et al*, 2007)⁽²⁵⁾, 4.02% (Mukasa - Mugerwa, 1981)⁽²⁶⁾ and 4.50% (Knoess, 1976)⁽²⁷⁾ for camel milk protein. It is reported that protein content of the feed as well as water intake can have a direct effect on the protein content of camel's milk (yagil, 1982)⁽¹⁹⁾. Stage of lactation also has been a profound effect on protein content of milk. Looper (2013)⁽²⁸⁾ reported that the concentration of milk fat and protein is highest in early and late lactations and lowest during peak milk production through mid lactation. Ash content ranged from 0.4 to 0.9% and from 0.7 to 0.8% in summer and winter, respectively. This result is in agreement with those reported by Haddadin *et al* (2008)⁽²⁹⁾ and Shuiep *et al* (2008)⁽³⁰⁾, they found that the average fat content, total dry matter and ash in Algerian camel milk collected in September is greater than collected in February, which is probably due to seasonal variation, lactation periods, the state of dehydration animals and feeds. Also the ash content value in this study is in line with

values reported by earlier workers. Omer and Eltinay (2009)⁽¹⁷⁾ reported an ash content of 0.88% for camel's milk from United Arab Emirates. Sesh *et al* (2012)⁽³¹⁾ on the other hand reported ash content ranging from 0.60 ____ 1.0% for camel's milk from India. The lactose content ranged from 2.5 to 3.5% and from 4.4 to 5.7% in summer and winter, respectively. This result is almost similar to that reported by Khaskheli *et al* (2005)⁽²¹⁾ who reported that the lactose content of camel milk produced in Pakistan varied from 2.91 to 4.12%. Large difference in lactose content may be associated to nutrition of the animal, that is, dependent on the kinds of plants which the animals feed on ⁽²¹⁾.

The total solids content obtained in this study ranged from 10.1 to 14.3 and from 8.2 to 15.2 in summer and winter, respectively.

An inverse relationship was found between total solids in camel milk and water intake by camel's. Our results in this study are agree with those reported by Kamal *et al* (2007)⁽²⁴⁾ who found that total solids were 13.9% in December and January and 10.2% in August due to availability of drinking water. Whereas Dowelmadina *et al* (2014)⁽³²⁾ reported the value $11.9 \pm 1.5\%$ for total solids content of camel's milk produced in Sudan.

Camel's milk composition was found to be less stable than other species such as bovine milk. However, variations observed in camel's milk composition could be attributed to several factors such as analytical measurement procedures, geographical locations, feeding conditions and samples being taken from different breeds, in addition to other factors including stage of lactation, age and calving number ⁽²¹⁾

Geographical origin and seasonal variations were found to be also the most effective factors in camel's milk compositions.

Konuspayeva *et al* (2009)⁽³³⁾ studied the effect of geographical origin on camel's milk composition and showed that the milk composition from camel's living in Est Africa have higher fat content than the milk from camels living in Africa and Western Asia. Variation in camel milk composition was also observed for camel's from the same species (dromedary) but domesticated in different parts of the world⁽³⁴⁾.

Table 1: Chemical composition of raw camel's milk produced in Khartoum State, Sudan (summer)

Sample No.	<i>A. Parameters measured</i>						
	<i>B. pH</i>	Density	Fat (%)	Protein (%)	Ash (%)	Lactose (%)	Total solids (%)
1	6.2	18.0	3.5	8.0	0.7	3.0	11.7
2	6.3	25.0	2.8	7.8	0.6	3.2	11.6
3	6.4	26.0	3.0	8.0	0.7	2.5	12.2
4	6.0	29.0	2.5	7.7	0.4	3.0	10.8
5	6.1	26.0	2.6	7.9	0.7	2.5	13.1
6	6.0	18.0	2.5	8.0	0.6	3.2	13.1
7	5.6	29.0	2.4	6.1	0.7	3.5	12.2
8	6.6	29.0	3.0	7.0	0.6	2.8	13.2
9	5.8	26.0	2.8	7.7	0.8	3.3	13.0
10	6.0	25.0	2.5	8.4	0.7	3.5	13.3
11	6.4	25.0	2.4	8.0	0.8	3.0	10.1
12	6.3	29.0	2.3	6.5	0.7	3.0	13.0
13	6.5	23.0	2.5	6.8	0.9	2.7	13.2
14	6.6	26.0	2.4	8.1	0.8	3.0	14.3
15	6.5	25	3.2	8.2	0.7	2.8	12.5

Table 2: Chemical composition of raw camel's milk produced in Khartoum State, Sudan (winter)

Sample No.	<i>C. Parameters measured</i>						
	<i>D. pH</i>	Density	Fat (%)	Protein (%)	Ash (%)	Lactose (%)	Total solids (%)
1	6.6	25.0	5.0	3.5	0.7	5.7	12.2
2	5.1	24.0	4.8	3.0	0.8	4.7	8.2
3	6.2	27.0	5.0	2.6	0.8	5.3	11.4
4	6.4	29.0	5.0	3.0	0.7	5.0	11.5
5	5.1	26.0	5.0	2.7	0.7	4.4	12.8
6	6.4	29.0	4.5	3.0	0.8	5.5	11.6
7	6.3	24.0	5.0	2.6	0.7	6.0	11.5
8	6.3	15.0	5.0	2.5	0.8	5.0	12.3
9	6.1	23.0	5.0	2.9	0.8	4.5	12.1
10	6.3	15.0	4.9	3.2	0.7	5.4	15.2
11	6.4	25.0	5.0	3.0	0.8	4.7	9.9
12	6.3	29.0	5.0	3.4	0.7	5.0	15.1
13	5.1	29.0	5.0	2.5	0.7	4.6	14.6
14	4.6	23.0	5.0	2.7	0.8	4.8	11.2
15	4.8	22.0	4.8	2.8	0.7	5.0	11.5

Conclusion

The variation of the chemical composition of Sudanese raw camel's milk could be attributed to the feed of the animals, stage of lactation, parity and breed of the camel. Thus there, is a need to conduct further studies to assess the effects of feeding, stage of lactation and parity on the composition of camel's milk.

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