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Physico-chemical properties of Sudanese Camel Milk

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ABSTRACT

The dromedary camel (Camelus dromedarius) plays an important socioeconomic role in rural populations and its milk is regarded as an important component of their staple diet. This study was carried out to study the chemical composition of camel milk from she- camels raised under pastoral conditions and farms conditions. The main parameters investigated included density , fat, solid non fat, protein and lactose. The density of milk obtained from pastoral was less than the samples obtained from farm (26.5% vs 29.9%). The mean fat percentage for milk from the pastoral conditions and the farm was 2.34% and 3.6% respectively with statistical difference between the means of the samples. Solid non fat percentage was 7.4% and 8.4%, protein concentration was 2.86% and 3.3% and lactose was 3.98% and 4.53% for pastoral and farm samples, respectively. The number of parities was found to affect some of the components of the milk such as density , solid non fat and lactose.

Keywords: camel milk, chemical composition, farms , traditional pastoral, Sudan

INTRODUCTION

The camel (*Camelus dromedarius*) plays an important role in the life of many communities and is considered an important livestock species in arid and semi arid areas [1]. It is also considered as an important source for meat and milk production and also used for transportation purposes [2],[3] . According to Food and Agriculture Organization statistics (FAO), the approximate number of camel in the world is about 19 million head, of which 15 million are found in Africa and 4 million in Asia. Furthermore, approximately 15 million dromedaries, representing two-thirds of the world camel population, are living in the arid areas of Africa, particularly in Northeast Africa. Somalia has the highest population of 7.00 million camel , Sudan has 4.25 million head and Ethiopia has 2.4 million head [4] ,[5].

In Sudan camels are distributed within specific areas forming a “Camel belt”. This area includes Khartoum , Kassala , Gezeira , Northern Sudan, Red Sea., North and South Darfur [6]. (Fig. 1).

Camels are well known for their ability to tolerate the harsh conditions of the desert with its high temperature and scarce water sources and although its demand for food is modest they can still produce milk more than other species . It can produce about 1000 and 2000 L of milk during 8 to 18 month of lactation [7] , [8].

Camel milk- also termed the *white gold of the desert* [9] is considered an important food for nomads with a good nutritive value and it has also gained a strong belief among consumers in its effect in the treatment of several diseases

such as hepatitis and diabetes [10-11]. It is also considered an important source of various substances that exerts some biological activities such as defense against free radicals and reactive oxygen species [12].

In Sudan camel milk is usually consumed fresh or as fermented milk (*gariss*) which is mainly processed under traditional conditions [6].

Different properties of camel's milk have been reported in comparison with milk from other animal species. For example camel milk was found to have ten times more iron than cow's milk. Vitamin C content is three to five times more than cow's milk. It is a rich source of B vitamins, immunoglobins, It has a higher level of protein and lower content of fat and cholesterol when compared to cow's milk and it contains insulin like proteins [10] [13].

Several factors can affect the quality of milk such as the number of parities, season, age, geographical location, feeding conditions, breed, stage of lactation, intramammary infection, environmental factors, and management practices, storage period and camel ecotype [13-16].

The main objective of this study is to investigate and compare between the chemical properties of milk obtained from she-camel raised in two areas under traditional pastoral and in farms in two areas namely Khartoum State and El Gezeira. Also factors affecting the milk composition will be studied.

Fig: 1 Sudanese camel



MATERIALS AND METHODS

Sample collection

Milk samples were obtained from she-camel from two areas; Khartoum State and El Gezeira area during the period from February to April 2015. Samples were collected in sterile tubes and stored in ice till they were brought to the laboratory at the College of Veterinary Medicine – University of Bahri for further analysis.

A pre structured -questionnaire was prepared to gather information about the area, age, number of parities and diseases available.

Laboratory Analysis:

Chemical analysis of milk samples was done using Lactoscan. Analysis included milk density, milk protein, lactose, fat and non solid fat.

Statistical analysis

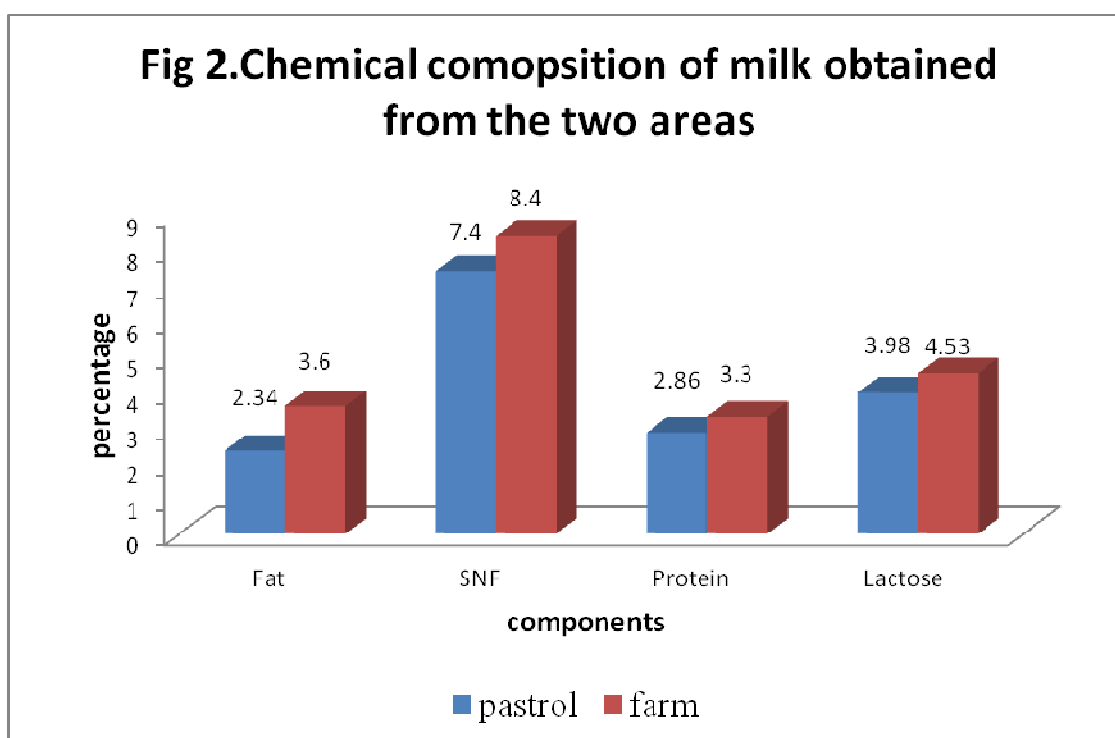
Data was analyzed using SPSS 17. Student *t test* and ANOVA were used for comparison studies.

RESULTS AND DISCUSSION

In this study, analysis was carried out for milk samples obtained from she-camel raised in two different areas: the field (pastoral conditions) and those raised in farms. A total of 65 milk samples were obtained (54% were from farms and 46% were from the pastoral area). The average age of the first group was 10 years while for the second group it was 9.7

years. The mean number of parities for both groups was 3 parities. No diseases were observed among the animals during collection milk samples. The results of the chemical analysis are shown in Fig. 2.

The density the pastoral milk samples was found to be less than the farm milk but with significant difference at $P < 0.05$ (26.5% vs 29.9%). Higher levels were reported by [17]. The mean fat percentage was 2.34% and 3.61% for pastoral and farm samples, respectively, with a statistical difference ($p < 0.05$) between their means. These results are in line with the previous reports [16], [18]. But these values are lower than that reported by other studies for samples obtained from camel raised under pasture conditions and in semi closed farms [1], [17], [19]. The fat content of milk can differ between different animal breeds and even between the same species. Higher fat content was reported for the dromedary camel (4.47%) compared to (5.39%) for bacterian camel, while cow milk contains higher fat than camel milk [13]. Among the important factors that can affect the fat content of milk is the hydration status of the animal, the type of forage eaten, seasonal variations and geographical origin as it was found that milk composition from camels living in East Africa have higher fat content than the milk from camels living in Africa and Western Asia [20], [21], [22].



Regarding solid non-fat, higher mean level was found for milk samples obtained from farms (8.4% vs 7.4%) with a statistical difference between their means. Similar results were reported for farm samples but higher level were reported for pastoral samples (8.42% Vs 8.55%) [17]. A range of 7% to 9.6% for solid non fat was reported by different studies [1], [16]. Total solid and fat percent of milk are affected by several factors such as lactation stage, while some other components of milk such as the ash content is influenced by camel ecotype [18], [19].

Regarding protein level, the mean levels were higher for farm milk (3.30% vs 2.86%). Previous studies reported the level of 3.66% and 3.22% for farm samples [1], [17]. Several other studies reported the protein level in the range of 2.1% to 4.35% for dromedary camel and it can even reach 5.4% for bacterian camel [13], [16], [18], [19]. The protein content of milk can be affected by protein content of feed as well as water intake [20].

As for lactose the mean percentage was (3.98% for pastoral samples vs 4.53% for farm samples). These results are similar to those reported by other workers [16], [18] for farm samples. The results are different from those reported by [17] who reported a lactose level of 4.94% for pastoral and 4.11% for farm milk samples and another study reported lactose level of 3.79%, while higher levels of 5.15% were also reported [1], [19].

In this study factors that can affect milk composition was also studied. The number of parities affected density, solid non fat and lactose for pastoral milk samples while the number of parities did not affect the composition of farm milk samples. The number of parities and stage of lactation was found to affect the levels of protein, lactose, and solid non fat [1]. Protein, lactose and solid non fat values were significantly the highest during the first stage of lactation and their levels gradually decreased during the subsequent parity [23].

CONCLUSION

The results of this study described some of the chemical properties of Sudanese Camel milk and the variation between milk samples collected from camels raised in open and closed systems. Further studies regarding different factors that can affect milk composition will be beneficial to elucidate the important characteristics of camel milk in comparison with other animals.

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