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ASSESSMENT OF THE MILK COMPONENTS OF IRAQI DROMEDARY CAMELS

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ABSTRACT

Camels' milk has gained so many attentions recently because of its unique therapeutic effects. Iraq is one of the Arab countries with a long history of camel husbandry and few studies regarding this important products' compositions. In this study fresh milk samples from 78 apparently healthy she camels from Wasit province were collected and analyzed. According to the results means ± Standard Deviation (SD) for Fat, Protein, and Lactose were 3.48 ± 0.95, 4.23 ± 1.61 and 4.3 ± 2.56 percent, respectively. In addition, values for Total solids, Solid non-fat, Salt values were 9.0 ± 1.43, 8.64 ± 1.75, and 0.73 ± 0.08 percent, respectively. And means ± SD for Density was 1.031 ± 0.0032 g/cm^3 in this study. Data analysis revealed that sampling date was correlated with the milk's fat, density, and pH (p<0.05). She camels' age was correlated with salt values of their milk (p<0.001); while, their parity numbers correlated with the protein and salt values of the milk (p<0.05). Our findings fell within the published literature with minor variations; however, higher means for fat, protein and lactose were yielded compared to studies from other countries. Owners should be educated that they could obtain milk with better quality and higher quantity by improving feeding and husbandry measures.

INTRODUCTION

Camel milk has proved to have many therapeutic benefits according to many studies (1-4). Camels have become the fifth most important dairy animals after cattle, water buffalo, goat, and sheep (5). Although the amount each she camel produces daily is not much, but they produce in poor feeding conditions and up to eighteen months (6). Camel milk composition has been studied by several researchers with various results: Fat: 1.2-6.4%, Lactose: 4.4%, Protein: 2.9-4.9%, Ash: 0.79%, Total solids: 11.9% (7-11).

The composition of the camel milk is known to be affected by some factors such as nutritional (12), geographical and seasonal variations (9), In addition, various breeds have also shown some variation in their milk compositions (13).

The published literature regarding camel milk is limited comparing to other dairy animals and more information is still needed to shed light on various breeds of camels in different geographical regions. Nearby, a few studies have been published in Iraq. In 2014, fifty she camel's milk from West of Iraq in Al-Ratba were analyzed while in Southern Iraq in Al Muthanna Al-Salihi *et al*. tested 30 she camels' milk in 2017 (14, 15) Even studies conducted on microbial contamination of milk and its product poorly involved camels' milk because of their low numbers in some regions (16).

Therefore, this study was designed to study the milk components of Iraqi local camels (Al-Mashael breed) in Wasit Governate with no previous studies and to assess the effect of age and parity number in addition to the sampling time on the milk composition.

MATERIALS AND METHODS

Sampling*:* Fresh milk samples (50 ml each) were collected aseptically in the morning milking from 78 apparently healthy she camels in the period from 22/March to 7/June 2019 in Wasit province. The participating she camels were distributed in a few herds in two areas named "Badra" and "Sheikh Saad" area and they all belonged to the red local breed called "Al-Mashael".

The camels were fed by natural grazing without additional concentrated food which was specified only for recently calved she camels and their calves. The samples were collected three to seven weeks after parturition in all cases. Sampling date, age and number of parities for each she camel was recorded. Milk samples were stored cool in sterile bags until they were analyzed using The Ultrasonic milk analyzer (Germany). The device used 10 ml for the analysis of each sample. Values for Fat, Lactose, Protein, Density, Total solids, Solid non-fat, salts, and pH of milk samples were then recorded.

Statistical analysis*:* Microsoft Excel (MS Office ProPlus, 2016) was used to record and categorize all the data. The SPSS software (version 20; SPSS, Chicago, IL, USA) was used for analysis. Multiple Regression analysis was used to find out the possible correlation between age and parity numbers with each of the camel milk components. Although the time period in which sample collection occurred was not long still, we analyzed our data to see if changes would be present by moving more into summer using the same test. A Confidence level of 95% was used and a *P* value of less than 0.05 was considered significant.

RESULTS

Samples and the milk components*:* The mean age of the 78 participating she camels was about 8 years with a mean number of parities being around two. The detailed characteristics of she camels and the components of their milk are shown in table 1.

Table 1 – Characteristics of the participating she camels and their milk components

Variable	Mean ± SD*	Min - Max
Camel characteristics		
Age (year)	8.15 ± 2.35	5 - 15
Parity number	2.28 ± 1.06	1 - 6
Milk components		
Fat %	3.48 ± 0.95	2.14 - 6
Protein %	4.23 ± 1.61	2 – 7.55

Lactose %	4.3 ± 2.56	2.5 – 6.8
Density g/cm^3	1.031 ± 0.0032	1.021 – 1.039
Total solids %	9.0 ± 1.43	5 – 12.6
Solid non-fat %	8.64 ± 1.75	4.7 – 11.78
Salt values %	0.73 ± 0.08	0.56 – 0.91
Conductivity ms/cm	6.82 ± 1.21	4.94 – 9.9
PH	6.5 ± 0.22	6.1 – 6.88

*Standard Deviation

Statistical Analysis: The regression analysis showed that sampling date was positively correlated with the milk's fat (p<0.001) and density (p<0.001) while it correlated negatively with the milk's pH (p=0.036). She camels' age was negatively correlated with salt values of their milk (p<0.001). Moreover, the parity of she camels revealed a positive correlation with the protein content of milk (p=0.048) and negative correlation with its salt values (p<0.001). Basic components of the milk (fat, protein, and lactose) were not correlated with the she camels' age (p>0.05).

DISCUSSION

The results of our study revealed that the milk components of apparently healthy Iraqi she camels were within the range of earlier literature (7-11). The means of fat, protein, and lactose of camel milk in our study were higher than some other studies in Morocco, United Arab Emirates, Egypt, Saudi Arabia and western Iraq that could possibly be justified by the better natural nutrient nature of this region compared to the beforementioned areas (13, 14, 17-20). Some of these authors confirmed a strong seasonal effect reporting the lowest camel milk compositions in summertime (13, 17-19). Our samples were collected in late spring and beginning of summer; therefore, one could possibly expect higher values within the same population in winter. This variation could represent the role of geographic and nutritional factors (9, 12). While some authors blamed nutritional factors for the lower milk components in the summer in camels kept in traditional systems (21) another study proved the same seasonal effect in camels living in concentrated systems regardless of the nutritional factor (13). Closer means with minor variations compared to our study were obtained in Al-Muthanna, southern Iraq for fat, protein

and lactose that also might be the result of more similarity in the geographical region (15). However, the wide range reported for fat in the later study (1.59-13.9%) was unique compared to the existing literature. With the protein range (2.74-7.15%) being close to ours (2-7.55%), the range of lactose (4.14-11.74%) was also higher (15). Al-Salihi *et al.* collected their samples at the same time season as ours and the nutrition seems to be the only influencing factor as Al-Salihi *et al* mentioned the use of concentrated food by their lactating she camels while camels in our study were not given additional food at the time of sample collection (15). Mohammed Salih and Al-Ani reported the means without mentioning the ranges for these components and their means for fat, protein, and Non-solid fat were lower than ours with similar means for Lactose and density (14). The most logical justification for these variations could be the fact that the beforementioned region is an arid desert with poorer nature.

Our study revealed that the higher the number of parities and age of she camels were the less salt values of the milk were recorded ($p<0.001$). Salt components of the milk include important salts and ions necessary for the young animals' development (22) and are considered important factors affecting the milk quality and cheese production (23). According to a study in northern Kenya which stated that mineral supplementation containing P and Co in camels increased the serum mineral parameters and the milk yield of camels (24) it is suspected that geographical places rich with important nutritional salts or additional supplementation with these salts can have positive impact on the milk production in camels. Furthermore, increasing age and parity has been known for an increase in milk yield per camel (13, 20) which if joined with insufficient feeding program may be the reason behind reduction of salt values in the current study. Moreover, higher parity numbers showed a significant positive correlation with the protein content of the milk in our study ($p=0.048$). Our finding is in contrast with other studies which reported higher milk yield in she camels with higher parity numbers along with lower fat and protein content [13]. In other words, it has been suggested that camels with higher milk yields produce milk with lower fat, protein and lactose content (13, 17, 25). On the other hands, another study came in agreement with our findings in that camels with higher parity numbers produce not only higher amount of milk but also richer in fat, protein, lactose, and salts contents (20). Further assessment is needed to see if geographical and nutritional factors have caused this variation.

According to our findings milk samples collected closer to summertime yielded higher fat and density (p<0.001). Fat content of the milk has been recognized as the most important factor affecting the milk density (26, 27). Therefore, the same variation of fat could expectedly be observed in density. Our findings contrast other studies that suggest the least amount of fat and protein in the milk produced in summer (17, 18) with an increased average milk production per camel (19). We did not study the average of milk production per camel in our study to see if it was increased towards summertime. While it remains necessary to have more comprehensive studies targeting a year-round time zone in addition to an individual milk yield evaluation, effects of breed, nutritional and geographical factors could explain some of the variations here.

In conclusion, Iraqi camels from Wasit governate yielded ranges of milk components within the published literature with some minor variations and higher means for fat, protein and lactose compared to studies from other regions even inside Iraq. Owners should be educated that Camel milk quality and quantity can be increased by better feeding and management (28).

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