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Proximate Analysis of Camel Milk Sourced from Kara Market, Sokoto, Nigeria

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The study of proximate analysis on camel milk was conducted with the aim to determine the proximate content of the camel milk. The camel milk was collected at Kara Market located at Sokoto, which was obtained from three different she camels. 200 ml was collected at early morning for three days and was transported to the Department of Biochemistry laboratory at Sokoto State University, Sokoto. The proximate analysis of camel milk was carried out on moisture, ash, crude lipid, crude protein, crude fiber, and carbohydrate contents. All the samples analyzed were done in triplicates. The mean of triplicates of camel milk sample revealed high (85.83%) moisture after drying and carbohydrate content (9.83%). There was average 0.5% ash, 1.8% fat, 2.03% protein in camel milk samples. Fiber (0.00 %) content was not observed in camel milk. In view of the results of the proximate analysis on camel milk, the presence of nutritional properties was observed in the camel milk, which it can be absorbed due its nutritional properties.

Keywords: Proximate, Analysis, Camel Milk and Kara Market.

1. Introduction

Milk is an excellent source of most essential minerals for human. It contains mostly calcium, phosphorus and constitutes the most important source of calcium. In our diet, milk and dairy products are part of a healthy diet. The composition of the milk of various animal species differs, but in every case it has a high priority in human nutrition (Guakhar and Bernard, 2004). The long-standing practice of using camel milk for medicinal purposes in the Middle East, parts of Africa and Asia, and the former Soviet Union was without scientific rationale for centuries. However, based on the existing information camel milk, could serve not only as a source of nutrients but also as a source of bioactive agents with therapeutic properties. There is need of more scientific researches, to identify the chemical composition more precisely from all over the world (Guakhar and Bernard, 2004).

Although camel milk has been well documented over the centuries and has received a growing interest during recent years, there has been scarce information regarding its quality and composition in Nigeria. Thus it becomes necessary to evaluate quality of camel milk in a significant district to ensure that this wonderful animal retains a special place in the heart of future generation. The results of this study could provide a detail of its nutritional value which is held in proximate analysis.

2. Materials and Methods

2.1 Sample collection

The camel milk was collected at Kara Market located at Sokoto. The camel milk was obtained from three different she camel. The she camels were rearing in kofar kade to kofar kware along kara market. The fresh camel milk (200 ml) was collected early morning for three days and was transported to the Biochemistry Department laboratory at Sokoto State University, Sokoto in 500 ml rubber container.

2.2 Determination of moisture by oven (ASEAN, 2011)

Crucible was placed in drying oven at 100^{o}C for about 1 hour. It was cooled in a desiccator for 30 min and the crucible was weighed. The above process was repeated until constant weight was obtained as (W_1). The sample was mixed thoroughly and 2 ml of the liquid sample was transfer into a pre-weighed crucible as (W_2). The sample was replaced back in oven at 105^{o}C for 24 hours. The crucible with the dried sample was transferred into desiccators. Crucible contained desiccant allowed to cool for 30 minutes and weighed (W_3). Moisture contain are calculated with used of the following formula:

$$\text{Moisture (g/100g)} = \frac{(W2 - W3)}{(W2 - W1)} \text{X } 100$$

Where: W_1 =weight of empty crucible (g)

W_2 = weight of crucible + sample before drying (g)

W_2 -W_1 = weight of sample

W_3 = weight of crucible + sample after drying (g)

W_2-W_3 = loss of weight (g)

2.3 Determination of ash by gravimetric method (ASEAN, 2011)

Marked crucible was heated in a furnace at 550°C for 1 hour. The furnace temperature was lowered to 180°C and the crucible transferred into desiccator, cooled for 30 min and weigh. The sample procedure was repeated to obtain constant weight (W_1). 2 g of the sample was measured in and duplicated into the pre-weight crucible (W_2). The sample was incinerated in a furnace at 550°C until the residue is uniformly white. The crucible was transferred into desiccators for 30 min and the crucible was weigh as (W_3). Ash contain was calculated by the following formula:

$$\text{Ash per } 100\text{g} = \frac{(W3 - W1)}{(W2 - W1)} \text{X } 100$$

Where W_1= weight of crucible

W_2 =Weight of crucible + sample

W_3= Weight of crucible + ash

2.4 Determination of lipid content (AOAC, 1995)

The continuous extraction of a fat content from the sample using n-hexane in a soxhlet extractor so that non- polar component of the sample will be easily extracted into organic solvent. Soxhlet extraction with reflux condenser and a small round bottom flask with 250ml of petrol ether and 500 ml of distil water were mixed, and 2g of liquid sample was placed in the thimble which has been and weighted as (W_1).The empty thimble and the sample was weight as (W_2) and the mouth of the porous thimble was covered with clean white cotton in order to allow the dropping n-hexane. The flask is then heated in the extractor and n-hexane was added until it was half in flask. The flask is then heated for five hours. The thimble was removed with care and the n-hexane in the top container was collected. The extract was removed from the water bath when it is almost free of n-hexane. Finally, the extraction flask coating the oil was weighed to know the content of the crude lipid. Lipid content was calculated by the following formula:

$$\text{Lipid\%} = \frac{W2 - W1}{W3} \text{X } 100$$

Where, W_1=weight of the lipid

W_2 = weight of sample

W_3 =weight of sample after dried

2.5 Protein was determined using the semi-micro Kjeldal method (AOAC, 1995)

Approximately 2 g of sample was weighed into a digestion flask together with a combined catalyst of 5g K_2S_4 and 0.5g of $CuSO_4$ and 15 ml of concentrated H_2SO_4. The mixture was heated in a fume hood till the digest color turned blue. The digest was cooled and transferred to 100 ml volumetric flask and topped up to the mark with deionized water. A blank digestion with the catalysts was also made and 10ml of diluted digest was transferred into the distilling flask and washed with about 2 ml of distilled water. Approximately 15 ml of 40% NaOH was then added and this was also washed with 2 ml of distilled water. Distillation was done to a volume of about 60ml distillate. The distillate was titrated using 0.02N HCl to an orange color of the mixed indicator, which signified the end point. Protein was calculated as:

$$\text{\%Protein} = \frac{(b-a)\times(0.1\times14.00}{w} \times 100 \times \frac{6.25}{1000}$$

Where:
1000 =the conversion of m gN/100 g to gN /100 g sample
6.25 = the protein-nitrogen conversion factor for milk and its by-products.

2.6 Carbohydrate Determination (AOAC, 2003)

When all other analysis has been carried out on the sample(s), the carbohydrate content can be calculated mathematically. The sum of all values gotten from the analysis of protein, fat, ash and moisture subtracted from 100, give the total available carbohydrate present in the sample.

i.e. 100 - %protein + %fat + %ash + %moisture = %carbohydrate

2.7 Data Analysis

Descriptive statistics was used to determine the percentage of the sample.

3. Results and Discussion

The proximate analysis of camel milk was carried out on moisture, ash, lipid, crude protein, fiber, and carbohydrate. All the samples analyzed were done in triplicates. The mean of triplicates of camel milk sample revealed high (85.83%) moisture after drying and carbohydrate content (9.83%). There was average 0.5% ash, 1.8% fat, 2.03% protein in camel milk samples. Fiber (0.00 %) content was not observed in camel milk.

Table 1: Proximate Composition of Camel Milk

Parameter	Trial			Mean±SD Triplicate
	1 (%)	2 (%)	3 (%)	
Moisture	89	88	80.5	85.83±4.64
Ash	0.5	0.5	0.5	0.5±0.0
Fiber	0.00	0.00	0.00	0.00±0.00
Protein	2.03	2.02	2.04	0.00±0.00
Fat	1.8	1.8	1.8	1.8±0.00
Carbohydrate	6.67	7.68	15.16	9.83±4.64
TOTAL (%)	100	100	100	

The present study observed high moisture (85.83%) which is range between standard 85 to 95% and (1.8%) fat contain which is less than the standard range (2.9 to 5.4%) but it can also reduce to 1.1% it depend on environmental factors and mode of feeding and water quality water taken by the camel. High moisture in camel milk is concordant with Kanhal and Hamad (2010). Who also reported high (86-88%) moisture content in camel milk. The reported fat content in camel milk in present study is lower than other studies (Khaskheli *et al*., 2005; Kanhal and Hamad, 2010)**.** The study was conducted during hot summer, during which the cow and camel secretes highly diluted milk with low fat. This could be the natural phenomena by which the camel young ones are supplied with sufficient nutritional value and water for adaptation in a desert environment. Secondly, water content of fodder and the type of forage eaten would also affect the water and fat content of the milk.

There was high carbohydrate (9.83%) content observed in the camel milk of present study than previous studies (Khaskheli *et al*., 2005 and Kanhal and Hamad, 2010)**.**This wide variation could be due to the fact that camel usually grazed on halophillic plants for example Atriplex, Acacia etc

Ash content of camel milk in present study was observed to be an average of 0.5% which was lesser than those reported by different workers *i.e.* in between 0.6 to 0.9 g per 100 g (Elamin and Wilcox, 1992; Kanhal and Hamad, 2010). The reason for low ash content observed could be due to less grazing of camel on bushes or plants grown at dessert area.

The protein content (2.03%) of camel milk in present study is relatively lower than what observed in other studies (Lapsson, 1990; Kanhal and Hamad, 2010). Protein content of the feed had directly affected the protein quality of milk (FAO, 1982). It must be because of the dry season during sample collection, when the camels have scarcity of food in natural environment and low economic condition of Nigerian people to feed the camels. However, the reported protein content in camel milk is higher than human milk (1.1-1.3%), as confirmed by Shamsia (2009) and Kanhal and Hamad (2010).

The variation in the results of different studies was concluded to be partly due to the inherited capabilities of the camels and/or attributed due to various seasonal and environmental factors as well as stage of lactation, age and number of calving. In addition, the feed and water quality and quantity available to the animals also play an important role.

4. Conclusion

In view of the results of the proximate analysis of the camel milk, the presence of nutritional properties was observed in the camel milk. Therefore, it could be concluded that camel milk could be nutritious milk for human consumption.

5. Recommendations

1. Further research work should be carried out using chromatography techniques.

2. Camels should be reared under same environment as cow and buffalo, to produce milk of high quality.
3. Further studies should be conducted on the medicinal value of camel milk.
4. Camel should be incorporated in to diary sector.

Conflict of interest

The authors declare no conflict of interest.

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