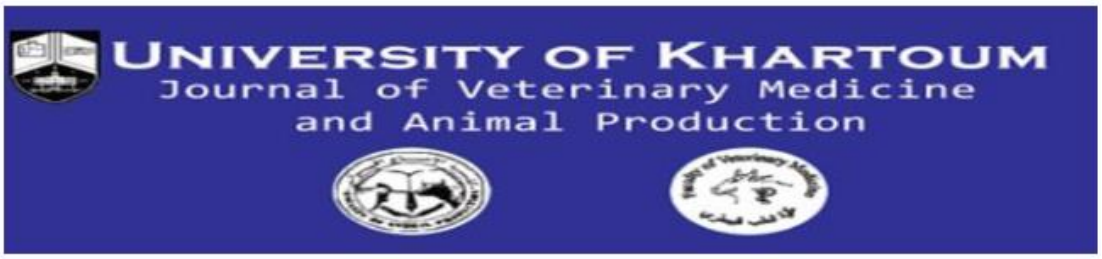
U. of K. J. Vet. Med. Anim. Prod., Vol. 7, Issue 1 (2016) ***p 75- 79***
ISSN: 24345



Impacts of parity order and udder quarter on colostrum composition of cows and she –camels

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Abstract

The present study was initiated to evaluate the effects of parity order and udder quarters on colostrum composition. The colostrum samples were collected from two different sites, the U. of K. dairy farm and Tamboul Camel Research Centre (TCRC). Six lactating cows at their 2nd, 4th, 5th, 7th, 9th and 10th parity together with two she camels both at their 3rd parity were selected from the U. of K. dairy herd. Three she camels at their 3rd, 4th and 5th parity were chosen from TCRC. Atotal of 66 colostrum samples were collected to represent the different parities, the three colostral days and the fore and rear udder quarters. The results revealed that parity order exerted different effects on the colostrum quality in the two species on colostrum quality. The cows colostrum contents of CP, TS and lactose were Sig. increased in the advanced parities (9-10). However in the she-camel colostrum only the CP content was favoured by advancing parities. The udder quarter effect on colostrum composition was not Sig in both species, however in the cow, the fore udder quarter colostrum was higher in all constituent except the fat. While in the she-camel the rear udder quarter excelled the fore udder colostrum samples in all constituents measured.

المستخلص

اجريت هذه الدراسة لتقييم تأثير عدد الولادات وأرباع الضرع في جودة السرسوب المنتج.جمعت عينات السرسوب من موقعين هما مزرعة جامعة الخرطوم ومحطة أبحاث الأبل في تمبول. تم اختيار ست ابقار مختلفة في عدد ولاداتها (الولدة الثانية، الرابعة، الخامسة، السابعة، التاسعة والعاشرة). اضافة الى ناقتين كلاهما في الولدة الثالثة من مزرعة جامعة الخرطوم وثلاث نوق من محطة ابحاث الابل بتمبول في مراحل الولادة (الثالثة، الرابعة و الخامسة). جمعت 66 عينة من السرسوب وتم تحليلها وتمثل الولادات المختلفة ،وفترة السرسوب في الثلاث ايام الاولي بعد الولادة وارباع الضرع الامامية والخلفية. اوضحت النتائج وجود تأثيرات مختلفة لعدد الولادات فى جودة السرسوب المنتج فى النوعين, حيث أثرت معنويا فى فى تركيز البروتين والجوامد الكلية واللاكتوز فى سرسوب الأبقار حيث أزداد تركيزها مع تقدم الولادات (التاسعة والعاشرة). بينما أثرت معنويا فى تركيز البروتين فقط فى سرسوب النوق حيث أزداد تركيزها مع تقدم الولادات. أحتوت الارباع الامامية للضرع فى الأبقار علي سرسوب ذو مكونات عالية عدا الدهن. بينما احتوي السرسوب من الارباع الخلفية في النوق علي التركيز الاعلي في جميع المكونات القياسية.

Introduction

Colostrum produced by cows during the first few days after calving differs significantly from milk with respect to composition. It is yellow alkaline thick and sticky. Colostrum contains more protein and has a higher concentration of lipids than milk. Other distinguishing features include a very high content of fat soluble vitamins, vitamin B12 and iron (Szulc and Zachwieja, 1998).

The camel colostrum is generally opaque-white of slight yellow, colour with a sweet and sharp taste caused by the type of fodder and availability of drinking water. Differences in camel colostrums composition may be due to physiological, behavior, type of feed and age of the animal (Yagil *et al*., 1994). The amount of colostrum produced depends on the udder capacity of she camel. When lactating she camels are kept at good nutritional plane and managed under hygienic conditions, the camel

colostrum is comparable to colostrum of other conventional sources in content, appearance and nutritive value (Abu Lehia *et al.*, 1989). The colostral period of the she camel colostrum is controversial. While some authors describe it as 5 days post partum, others postulated longer colostral periods (Musa, 2001).

The immunity that newborn calves receive from colostrum increases their chance of survival. On arid, semi arid and semi-intensive system camels are the most important source of both milk and meat production in Sudan (Alamin, 2006). Colostrum is not only a source of nutrients such as protein, carbohydrate, fat, vitamins and minerals but it also contain several biologically active molecules, which are essential for specific functions (Kukarni and Pimpale, 1889 and Playford, 2001).

Studies pertaining to colostrum content of immunoglobulin concentration and the factors affecting are meger in Sudan.

The objective of the present study was to assess and compare the chemical and immunological quality of bovine and Cameldiae colostrum at different parities and management system.

Material and Methods

Study site and experimental animals

The present work was carried out at two locations. The first experimental site is The Camel research center (CRC) affiliated to the University of Khartoum dairy farm. The second experimental site was Tamboul Camel research Centre (TCRC).

Six lactating cows at 2^{nd},4^{th}, 5^{th},7^{th}, 9^{th} and 10^{th} parity were selected, Immediately postpartum. Colostrum samples of 500ml each were collected from each cow on day one, day 2 and day 3to cover the colostral period. Two samples representing fore and rear quarter, were secured from each cow in two separate vials for the three colostral days, six sample from each cow with a resultant of 36colostrum samples .The samples collected were frozen on collection day and transferred to the Laboratoryfor determination of chemical components .Concerning the camel colostrum, five she camels, three of which belong to (TCRC) and the other two from the CRC were selected .The same procedure of colosrtoum sampling described for cows was a adopted. A total of 30 samples were secured and analyzed for chemical constituents. The selected she camels from (TCRC) were at their 3^{rd},4^{th} and5^{th} parity, while those of the camel research center(CRC) were both at their 3^{rd} parity.

Chemical analysis of samples

Duplicate samples of colostrum for each day were subjected to analysis using the conventional methods. Standardized colostrum samples were analyzed for fat (Gerber), protein (Kjeldhal) according to Marshall (1992), lactose was determined by anthrone method (Richard, 1959), total solid was determined by forced draft oven method (Bradley *et al.*, 1992). However immunoglobulin analysis was carried out by colostrometer according to the manual instructions Fleenor and Stott (1980).

Statistical analysis

The collected data was subjected to analysis of variance using General Liner Model (G.L.M) of statistical Package of social science (SPSS) Programme.

The Results and discussion

The data in Table 1 describes the impact of parity order on colostrum quality in the studied cows. The results indicated nosignificant on fat content. The fat content showed a decreasing pattern with advancing parities. The least fat content was obtained in cows with later parities while the highest fat was recorded for cows in their early parities.

Colostrum of animals in their early parities maintained significantly (P>0.05) the higher content in, lactose and protein. This may be due to increase in body size of the animal and development of the animal mammary glands. The overall mean of colostrum samples from experimental animals revealed that the fat

content showed a wide variability with a mean of 18.47±7.60 this result is higher with the finding of Tsioulaps *et al.* (2007) who reported mean fat content in bovine colostrum as 3.6%. Roy (1980) reported average fat content in bovine colostrum as 3.5%. The result is however higher than what was found by Naylor *et al.* (1991). Who reported 6.7%.fat in bovine colostrum, also higher than the result found by (Szulc and Zachwieija, 1998) who reported that bovine colostrum contains 7% fat. The different breeds used might have contributed to this disparity.

The total solids content recorded the highest value in cows at their later parities cows which was significantly (P>0.05) higher than in earlier parities.

The highest protein content was recorded for earlier parities cows which was significantly (P>0.05) higher than in later parities.

The lactose component of colostrum was significantly lower (P>0.05) in cows in later parities. The lactose content of colostrum is minimum compared to lactose content of milk. This finding complies smoothly with previous finding authenticated by Czister and Dirijarea (2003).

Both ash and immunoglobulin components were affected by parity order, however the highest immunoglobulin concentration was reported for the later parities (41.44mg/ml), which was significantly (P>0.01) higher than that of the earlier parities. The results indicated that colostrum immunoglobulin increased with advancing parities.

The immunoglobulin in bovine colostrum varies widely on number of pregnancies, the area of transferred of compound to colostrum by mammary glands and the actual volume of colostrum produced. Cows in the later parities were found to have the highest immunoglobulin concentration compared with cows on the earlier parities. This result is consistent with previous studies (Tyler *et al.*, 1999). The current findings reported no statistical difference in colostral immunoglobulin concentration among in the earlier parities and more research is needed in this area.

Table 1: The effect of parity order on chemical composition of cows' colostrum

Variables	**Early parities**	**Later parities**	**SL**
Fat **%**	18.08±4.728[a]	18.86±10.488[a]	NS
Protein **%**	4.04±3.113 [a]	3.18±3.382[a]	*
Total Solids **%**	14.40±5.292 [b]	15.24±4.332[a]	*
Lactose **%**	0.87±0.083[a]	0.85±0.254[a]	NS
Ash **%**	3.80±0.866[b]	4.09±0.915[a]	*
Ig mg/Ml	34.72±31.136[b]	41.44±28.12[a]	***

Values with different superscripts differ significant at P< 0.05.

*= P<0.05, ***= P<0.001

The data in Table 2 quantify the impact of three different parities on she-camel colostrum chemical composition.

The results verified a significant (P<0.05) impact on the studied component with the exception of C.P. the C.P of colostrum was significantly (P<0.01) reduced in the 4th parity compared to the 3rdand 5th parities. The lowest fat concentration was recorded for the 5th parity (0.59±0.63%). The T.S were highest at the 4th parity, while the highest lactose was evident in the 3rd parity (6.44±3.31%). The 4th parity colostrum was also characterized by the least Ig concentration (43.3±8.1mg/ml) as compared to the 3rd (66.6±29 mg/ml) and the 5th (65.8±33.7 mg/ml) parities.

She camel in their third parity recorded the highest mean fat content (1.98±2.13%).

She camel in their 5th and 3rd parities recorded the highest protein content (10.75±5.81and 10.48±5.10%) respectively. She camels in their 3th and 5th parities were found to have the highest immunoglobulin concentration (66.61±29.45) (65.83±33.37mg/L), respectively.

Variations in colostrum composition of camel have been well documented in the literature. These variations arise from a variety factors including; breed differences, parity order, age of

the animal, type of nutrition, water availability, season of the year and general management (Yagil *et al*., 1994). The discrepancy between the presentvalues and others quoted from different studies may be justifiable when these factors are considered. Khalid *et al.* (2007) reported a range of 35.7%-35.5 g/I for protein, 34.10-31.20 g/I for lactose, the wide variation in lactose content was evident.

The data on the effect of udder quarter position on the quality of colostrum is displayed in Table 3.

Table 2: Effect of parity order on quality of Camelidae colostrum

Parity order				
Variables	**3**	**4**	**5**	**SL**
Fat %	1.98±2.130[a]	1.60±0.681 [a]	0.59±0.635 [a]	NS
CP %	8.18±5.104 [c]	9.96±1.172[b]	10.75±5.812 [a]	***
TS %	16.70±2.855 [a]	18.37±13.392 [a]	16.16±4.636 [a]	NS
Lactose %	5.44±3.315 [a]	6.10±1.083 [a]	4.78±0.341 [a]	NS
Ash %	1.10±1.077 [a]	0.71±0.168 [a]	0.68±0.039 [a]	NS
Ig mg/mL	66.61±29.456 [a]	43.33±8.140 [a]	65.83±33.379 [a]	NS

Table 3: Effect of udder quarter on colostrum in cows

Variables	**Fore**	**Rear**	**SL**
Fat %	7.57±4.881[a]	8.19±4.159 [a]	NS
CP%	2.48±1.972 [a]	2.32±1.810 [a]	NS
TS %	14.89±5.044 [a]	14.76±4.416 [a]	NS
Lactose %	0.91±0.268 [a]	0.81±0.167 [a]	NS
Ash %	3.88±0.823 [a]	4.01±0.986 [a]	NS
Ig mg/mL	39.33±30.584 [a]	36.83±30.0592 [a]	NS

Table 4: Effect of udder quarter on colostrum quality of the she camel

Variables	**Fore**	**Rear**	**SL**
Fat %	1.30±1.309[a]	1.96±2.122 [a]	NS
CP %	8.99±4.778 [a]	10.16±5.364 [a]	NS
T.S %	15.32±3.106 [a]	18.53±8.227 [a]	NS
Lactose %	6.10±2.529 [a]	5.99±2.881 [a]	NS
Ash %	1.11±1.192 [a]	0.77±0.148 [a]	NS
Ig mg/mL	62.80±26.175 [a]	60.80±31.156 [a]	NS

The results revealed that quarter position played anon significant effect on colostrum quality. The rear quarter however, excelled the fore quarter in fat and ash content, while the fore quarters samples were higher in C.P, T.S, lactose and I g concentration. The rear quarters of cows recorded the highest mean fat content (8.19±4.15%). However the fore quarter recorded the highest mean protein content (2.48±1.97%).

The udder quarter position seemed to exert nosignificant effect on colostrum quality in the she camel, as suggested by the data in Table 4. The colostrum obtained from fore quarter, secured higher values in Ig concentration, ash and lactose, whereas the rear quarter colostrum was superior in fat, C.P and T.S components. The rear quarters of she camel recorded the highest mean fat content (1.96±2.12%), and highest mean protein content (10.16±5.36%).

Conclusion

Colostrum basic composition at parturition contains higher fat, SNF and total solids but lower lactose than normal milk. All investigated chemical components tend to decrease with advancing postpartum period except for lactose and fat, which showed an increasing trend. The colostrometer apparatus is however easy, simple and quick device to give a reasonable indication of the quality of colostrum. Hence it is recommended that it is highly required to investigate colostrums and calves rearing methods under traditional system and semi intensive system to evaluate the impact of these variables on the high neonatal mortality rates encountered in traditional system.

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