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Studies on Some Camel Management Practices and Constraints in Pre-urban Areas of Khartoum State, Sudan*

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Abstract: The present study was done to investigate the general information about camel's herders, camel health, general management and husbandry, general aspects of the herders' farms and their view of the camel production. Three herds (2937 camels) at Khartoum State (Omdurman and Eastern Nile; Eid babiker and Alkadero) were selected for the present survey. The investigation revealed that the ratio of females' camels is particularly higher than that of males in the three herds. Female' and males camels were 83.9 and 16.1%, 74.6 and 25.4% and 76.1 and 23.9% in Omdurman, Eid babiker and Alkadero, respectively. The milk produced was found to be for family subsistence and offered free for the others; for medicinal purposes. The camels might come in contact during breeding, browsing and at water points. The other species of animal don't come in contact with camel at Omdurman and do at varying levels at other regions. In Omdurman herders are sharing lands (communal land), while in Eastern Nile (Eid babiker and Alkadero) they own lands. Also differences of food and water sources and uses in the three regions were found. The camel herders support their camels with minerals (common salt), moreover camel herders at Omdurman give their herds licking stone. The incidences of some common diseases were carried out, the abortion's incidences, although high among the three herds, it showed non-significant differences. The screening for the treatment of internal parasites showed highly significant ($p < 0.001$) different between the three herds.

Key words: Camel, management practices, diseases, Khartoum State, Sudan

Introduction

Sudan is an agricultural country with the largest population of livestock in the Arab world and is the second in Africa after Ethiopia. According to last estimates of livestock, there about 37.1 million heads of cattle, 46.1 million heads of sheep, 83.5 million heads of goats and 3.1 million heads of camels (Anonymous, 2000).

The camel is found in zones, which are difficult for other livestock, In Sudan the camel is found occupying a geographical zone to the north latitude 14° N in the west and 16° N in the east (Wilson, 1984). The ability of the camel to survive in semi-arid conditions makes it an important source of food in drought areas of the world, where famine is endemic to over 70 million people each

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year (Yagil, 1984). The camel is an important livestock species uniquely adapted to hot and arid environments. It produces milk, meat, wool, hair and hides and it also serves for riding, draft animal for agriculture and short-distance transport (Schwartz, 1989; Baars, 2000; Salhab and Al-Merestani, 2002; Negatu, 2002).

Elamin (1979) reported that the bulk of camel population in Sudan is found mainly in the arid and semiarid parts of the country, north latitude. This belt is characterized by erratic rainfall, less than 350 mm. Diseases such as trypanosomiasis and the unsuitability of the clay soil limit migration to the southern part of the country. However, as a consequence of recent drought, seasonal migration took the animal deep south of the limits. Ali (2002) reported camels play an important role in all pastoral societies in Butana area of Sudan and that its milk is the main source of food for herd's men. Moreover Kaufmann (2005) reported that camels (*Camelus dromedarius*) produce milk and offspring and provide transport in pastoral husbandry systems in the Afro-Asian dry land belt.

Bakheit (1999) reported that management systems of camels depend on factors including environmental conditions, composition and size of the herd and the degree to which the herders are dependent on their herds as it may be raised alone or mixed with sheep and goats and some times cattle. The three main management systems for camel in Sudan include the traditional nomadic system, transhumance system and semi-intensive system. Moreover, its cultural importance has been maintained by the introduction of camel racing (Gihad, 1995).

The camel's herders rely completely on camel's milk for more than a month without having drinking water (Bakheit, 1999). Camel's fermented milk (Garis) constitutes the sole diet of camel herders for considerable periods, in western Sudan and during the migratory routes to the Gizu steppe lands (Dirar, 1993). Camel milk contains protein percentages higher in albumin and globulin fractions and the percentage of short-chain fatty acids in camel's milk is higher than that of cows, buffalos and sheep. Moreover vitamin C content of camel's milk is three times greater than that of cow's milk, which is important for desert inhabitants, where lack of plant sources of this essential vitamin is obvious (Bakheit, 1999). The shelf life of camel's milk is longer than any other milk (it is possible to keep it in a liquid form without curdling for 12 days at 4°C and for more than 48 h at room temperature, as to compare to cow's milk which can be maintained only for 36 h at 4°C and 12 h at room temperature), Since it contains antibacterial agent especially for lactic acid bacteria that decomposed lactose (Yas, 1998).

Bakheit (1999) illustrated variation of camel milk as compared to other livestock. The most striking feature of camel's milk as he reported is the variation of water content with aridity and environmental temperature changes. Wilson (1984) reported that there is need for optimum reproduction and production patterns, which allows the household to maintain some continuity in subsistence. Since any improvement in camel production should ideally lead to raising the standards of living of the herders.

With the increasing human population pressure and declining per capita production of food in Africa, there is an urgent need to develop previously marginal resources, such as the semi-arid and range lands and to optimize their utilization through appropriate livestock production systems, of which camel production is certainly the most suitable one (Schwartz, 1989). For this reasons this study was conducted to give some light on the general information, husbandry, problems and constraints that limit the production potential of camels and evaluation of the management practices under traditional transhumance systems around Khartoum State (Sudan).

Materials and Methods

This investigation was carried out on the three herds areas of camels (*Camelus dromedarius*) in the pre-urban areas around Khartoum State (2937 camels) during the period of September and October 2001.

Field visits were arranged to 90 camels' herders in the selected areas of study (30 in each area) in order to fill in the questionnaires to report the herding practices. The camels' herders were questioned about the general information about their farms, camels' health, general management and husbandry and general aspects of their farms and their view of camel production.

Statistical Analysis

Data were analyzed by SAS Computer Program (1989). t-test was used for the comparison of education levels of the herders, abortion's incidence and the screening for the treatment of internal parasites.

Results and Discussion

Table 1 showed that most of the herders' surveyed during this study were used and spend most of their life in camel herding. However, few were found to enter this enterprise recently. The practice of camel herding is very well documented in Sudan, since some of the tribes of Sudan rely completely on herding and the pastoral is the life style of some of them (most of the types of livestock, specially camels are named according to the tribe rearing them).

The results of the present study (Table 2) have indicated that female camels in Khartoum State (Omdurman, 83.9%, Eid babiker, 74.6% and Alkadero, 76.1%) are higher in ratio as compared to males camels (Omdurman, 16.1%, Eid babiker, 25.4% and Alkadero, 23.9%). This result was in accord with the data reported by Wilson (1984). Since the entire investigations in the three herds claimed that the problems do they experienced with the high numbers of intact males in the herd especially during rainy season, are exciteness and food competition. The milk produced was found to be mainly, according to the present survey, for family and herders uses. However, sometimes it offered free for other people for medicinal purposes. This might be due the lack of proper marketing channels for camel products which supported Desta and Coppock (2003) who reported that economic links between pastoral households and local towns still appear rare. Hence they suggested that a focus on improving risk management by facilitating household economic diversification and restoring some aspects of opportunistic resource use may be the most appropriate development options.

The present data (Table 3) also were within the range obtained by King (1983) who reported that nomadism is the major form of grazing management and use. Moreover, these patterns of seasonal movements suggest that the climate conditions coupled with the lack of water are the main reasons for these systematic migratory movements.

The data of the present study indicated that the camels might come in contact during breeding, browsing and at water points (Table 3). The other species of animal don't contact camel in Omdurman and do at varying level at other regions. This is because in Omdurman region there is a biggest camels market (named Libya market) and also the herders are sharing communal lands, while in Eastern Nile (Eid babiker and Alkadero) they own lands as shown in Table 3. However camel herders at Omdurman spent grater time with their herds compared to other location as represented in Table 1.

Table 1: The time that the camel herders spend practicing herding at Khartoum State

Omdurman		Eastern Nile			
		Eid Babiker		Alkadaro	
No. of year	(%)	No. of year	(%)	No. of year	(%)
5	3.3	20	6.7	15	3.6
10	6.7	25	13.3	20	3.6
15	6.7	29	3.3	25	10.7
18	3.3	30	6.1	30	7.1
20	10	35	3.3	40	14.3
25	13.3	36	3.3	45	21.4
26	3.3	40	23.3	50	14.3
30	10	45	10	55	14.3
35	16.7	50	10	60	10.7
40	3.3	55	13.3		
45	10	56	6.7		
48	3.3				
50	6.7				
56	3.3				

Table 2: Total numbers of camels and the percentages of females and males in the three herds in Khartoum State

Region	Male	Female	Total
Omdurman	304 (16.1%)	1581 (83.9%)	1885 (64.2%)
Eid babiker	141 (25.1%)	414 (74.6%)	555 (18.9%)
Alkadaro	119 (23.9%)	378 (76.1%)	497 (16.9%)

Table 3: General practices and management in the different regions of Khartoum State

Different practices	Omdurman		Eid Babiker		Alkadaro	
	Yes	No	Yes	No	Yes	No
Camel kept only to farm	0	100	0	100	3.3	97.6
Uses of antibiotics to the newly arrival camel	0	100	100	0	100	0
Screen for diseases before introduction to the herds	100	0	0	100	0	100
The share-ness of food and water with other animals	0	100	0	100	100	0
Aborted fetus left at abortion's site	100	0	100	0	96.7	3.3
Feeding by hand	100	0	30	70	100	0
contact of camels with others animals:						
During breeding	80	20	100	0	100	0
During browsing	0	100	0	100	100	0
At water points	43.3	56.7	100	0	0	100
On other places	83.3	16.7	100	0	100	0
All the time	20	80	0	100	0	100
Caring of the farms by farmers:						
Themselves	83.3	0	100	0	100	0
Their children	0	100	100	0	100	0
Others	16.7	100	0	100	0	100
Milking process of female camel by:						
Herders	0	100	100	0	100	0
Their children	0	100	0	100	100	0
Others	100	0	0	100	0	100
The present of other livestock on camel farms:						
Cattle	0	100	100	0	100	0
Sheep	0	100	100	0	86.7	13.3
Goat	0	100	100	0	86.7	13.3
Poultry	0	100	96.7	33	100	0
For how long herds give colostrum to the newly born:						
7 days	0	100	100	0	100	0
10 days	100	0	0	100	0	100
The Lands owned by herders:						
Alone	0	100	100	0	100	0
Shared	100	0	0	100	0	100

Table 4: Sources of food and water for camels in pre-urban areas of Khartoum State

Different practices	Omdurman		Eid Babiker		Alkadaro	
	Yes	No	Yes	No	Yes	No
Supplementation of camels with cut-forage	96.8	3.3	100	0	100	0
Shortages in camels feed in January and March	93.3	6.7	100	0	100	0
The management of shortage in feeds during dry seasons						
Prepared feed in advance	0	100	0	100	0	100
Buy commercial feeds	0	100	0	100	0	100
Reduce the number of camels	6.7	93.3	0	100	0	100
Water by:						
Common streams	100	0	100	100	100	0
Water pipe	0	100	3.3	96.7	0	100
Buying water	0	100	96.7	3.3	100	0
The use of minerals in camels farms:						
Common salts	100	0	100	0	100	0
All the time	0	100	0	100	0	100
Once a week	0	100	0	100	100	0
Once a month	100	0	100	0	0	100
Commercial salts	0	100	0	100	100	0
All the time	0	100	0	100	0	100
Once a week	0	100	0	100	0	100
Once a month	0	100	0	100	100	0
Other minerals:	100	0	0	100	0	100
All the time	0	100	0	100	0	100
Once a week	0	100	0	100	0	100
Once a month	100	0	0	100	0	100
Minerals from:						
Market	100	0	100	0	100	0
Veterinary store	0	100	0	100	100	0

Table 5: The occurrence of some health constraints and some epidemic diseases of camel in Khartoum State

Different practices	Omdurman		Eid Babiker		Alkadaro	
	Yes	No	Yes	No	Yes	No
The distance of veterinarian from camel's farms						
Few meters	100	0	0	100	0	100
Don't know	0	100	100	0	100	0
The occurrence of other health constraints in camel's farm						
Hypertension	100	0	0	100	0	100
Eye worm	100	0	100	0	0	100
Foot rot	0	100	100	0	100	0
Tonsillitis	0	100	0	100	100	0
The list of epidemic diseases which occur in camel's farms and the seasons of its occurrence						
Camel pox in winter	100	0	100	0	100	0
Contagious skin necrosis in rainy season	0	100	0	100	100	0
Abscesses in summer	100	0	100	0	0	100

Management, reproduction, nutrition and diseases were reported to be the most encountered constraints for camel herders as demonstrated in Fig. 1. The supplement of camels with cut-forages during hot dry months (April and June) as shown in Table 4 was practiced by some herders to overcome the shortage of milk production. This investigation was in agreement with Schwartz *et al.* (1989) who reported that the pasture production is marginal and forage yields are highly variable by season and year. In this study some camel herders particularly in Omdurman (6.7%) overcome this shortage of feed; during the rainy season; by reducing the numbers of their camels. Although this study showed that the movement of camel herders from natural grazing areas during rainy season in order

Table 6: Comparison of some differences between camel herders, their original herds and their treatment of internal parasites

Measurement	Mean	Standard deviation	Standard error	Minimum	Maximum	t- calculated	Probability
Herders' education:							
Omdurman	2.67	6.91	1.26	0	2	2.11	0.04*
Eid Babiker	0	0	0	0	0	2.11	0.04*
Alkadaro	0	0	0	0	0	2.11	0.04*
Origin of breeding stock:							
Omdurman	0	0	0	0	0	-2.41	0.02*
Eid Babiker	1.67	3.79	6.92	0	1	-2.41	0.02*
Alkadrao	0	0	0	0	0	2.15	0.36
Treatment of parasites:							
Omdurman	0	0	0	0	0	-20.15	0.001***
Eid Babiker	9.33	2.54	4.63	0	1	-20.15	0.001***
Alkadrao	0	0	0	0	0	28.49	0.001***
Abortion:							
Omdurman	1	0	0	1	1	1	0.33
Eid Babiker	0.97	1.83	3.33	0	1	1	0.32
Alkadrao	1	0	0	1	1	-1.02	0.31

• represents the code for the different educational levels

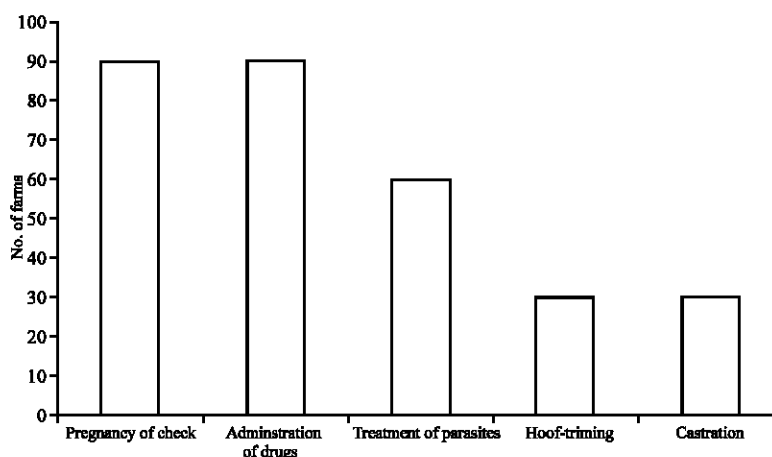


Fig. 1: General management practices in different camels farms in Khatoum State

avoid the convenient wet conditions and flies and to make use of the nutritive forages available in northern and “Goz” areas as shown in Table 3 and Fig. 2. At the end of the rainy season and the beginning of dry season they return back to natural grazing areas to make use of the preserved grazing in clay soil. This supported Dirar (1993). The camels that handle extreme dehydration do not need to drink water for more than a month (Table 4). Similarly Negatu (2002) cited that camels in Ethiopia are watered every 15 days if it is soft water and every 25 days if it is hard water. Schwartz (1986) postulate similar findings, where he reported that the ability of *Camelus dromedarius*, to adapt the extreme aridity of the habitat is unique amongst large herbivores and the most significant aspect of this adaptation is the economic use of water in almost all metabolic functions. Some camel herders from Alkadaro; when they come back to their farms during the dry months; sometimes they buy water for their animals. The optimum number (96.7%) of the camel herders buying water are in Eid Babaiker, where only 3.3% of the camel herders are used to get water supply by water pipe and (Table 4).

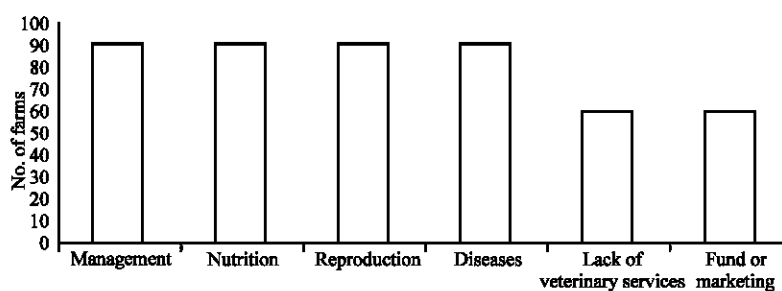


Fig. 2: General problem and constraints associated with camel management and rearing in pre-urban areas of Khartoum State

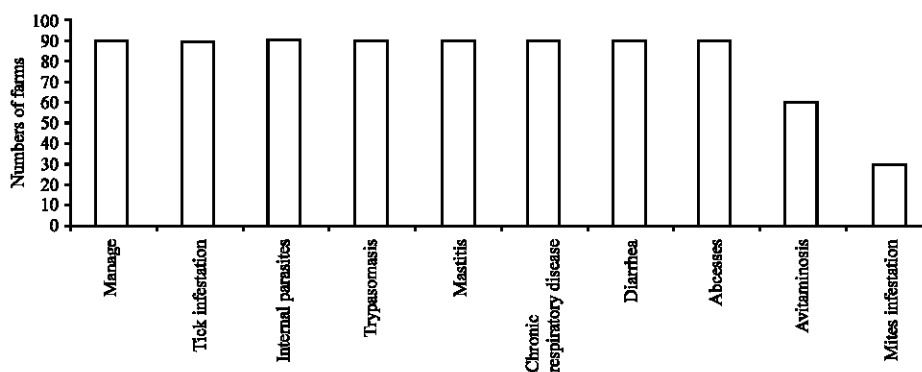


Fig. 3: Incidences of camels' diseases in pre-urban area in Khartoum State

Although in this investigation the camel herders in the three regions supported their camels with common salt once monthly from the market but the camel's herders of Alkadaro give it once a week. Moreover at Omdurman, some herders are given their herd other additional salt (licking stone), which they used to get from veterinary stores (Table 4).

The occurrence of some camel diseases (mange, tick infestation, internal parasites, trypanosomiasis, mastitis, chronic respiratory disease, diarrhea, abscesses, Avitaminosis and mite infections) as shown in Table 5 and Fig. 3 were in support to the finding of Pacholek and Agab (1993). Moreover the incidences of these diseases were found to be liner across the three herds. However mite infections might occur particularly in Omdurman. The incidences of other health constraints and epidemic diseases in camels' farms, which were investigated during the present study (Table 5 and Fig. 3) are hypertension, eye worms, foot rot, tonsillitis, camel pox and contagious skin necrosis. This was in support to Younan (2002) who reported similar diseases in camel at Kenya. Moreover in Omdurman, hypertension, eye worms, foot rot and abscesses were found. In Alkadaro, foot rot, tonsillitis, camel pox and contagious skin necrosis were reported. Moreover the incidence of abortion was found to be common among the three herds with non-significant differences between them (Table 6 and Fig. 2). On

the other hand this result indicated that the screening for the treatment of internal parasites showed highly significant differences between the three locations ($p < 0.001$). This might be due to the variations of education, as in this investigation there was a significant difference ($p < 0.05$) in the education levels among the herders. Also the origin of breeding stock in the three herds was found to be significantly different ($p \leq 0.05$) as shown in Table 6. As the survey showed that the camel herders in Omdurman, are more sophisticated in their attitudes and their herd's construction and management.

It is therefore; thought that research on camel should be an integrated in the sense that the results of research should be disseminated amongst herders, so as to become aware of the recent patterns of interaction with recurrent drought situation from which their traditional way of life has suffered severe setbacks (Salih, 1989).

It is very well documented that camel husbandry make a significant contribution to national economies in Khartoum State and Sudan. Unfortunately it is very difficult to evaluate the economic significance of camels' milk production, Since almost all milk produced is to satisfy the household and herders. However, a considerable effort is required to facilitate development and implementation of feasible and sustainable interventions to improve camels' milk production. Hence, the present investigation suggests that a number of dairy camels are to be kept in well-managed farms and fed with purchased feeds to produce milk for human consumption. Moreover if traditional reservations against selling of camel's milk give way to more commercially oriented attitudes. these will lead to food security and improvement of pastoral traditional way of life. This because of the nutritive and medicinal values of camel's milk, effort should be directed towards changing the traditional attitudes of camel herders by accepting to market their milk and milk products. Since one of the outcomes of the present survey is the willingness of camel herders for training and social improvement of their living style.

It is recommended that special attention should be given to the camel and farm's sanitation, biosecurity, general health problems, proper vaccination schedule, general management and husbandry and educational programs. Veterinarian, rural extortionist, animal scientist and governmental and private sectors could do that by group discussion and in field training and through television and radio.

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