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Production Systems and Dairy Production of Sudan Camel (*Camelus dromedarius*): A Review

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Abstract: Sudan ranks first among the Arab countries and second in Africa with respect to animal population. The Sudan is considered as the second country in the world in camel's population (more than 4 millions). The history of the dromedary camel in the Sudan is even more obscure. It is believed to have entered the Sudan from Egypt. The oldest evidence is a bronze figure of camel with a saddle found at Merwi and estimated to date between 25-15 B.C. Camels in the Sudan are spread in a belt configuration; it extends between latitudes 12°-16°N. This belt is characterized by erratic rainfall, less than 350 mm. and contains two main regions: the Eastern state, whereas camels are found in the Butana plains and the Red Sea hills and the Western Regions (Darfour and Kordofan). In Sudan the production systems include: traditional nomadic system, transhumant or semi-nomadic system, sedentary or semi-sedentary system and intensive system which is limited to racing and dairy camels. Camels in most pastoral societies are milked by men (one or two herdsmen) and to prevent calves from suckling at pasture during the day it is common among the nomad, to tie up one or more teat with special strings. Milk yield of Sudan camel can reach 10 kg/day in the early lactation and good conditions and declined to 2 kg/day in the late lactation and bad conditions (in best animal) otherwise it range 5 - 10 kg / day. Most of the camel milk in the Sudan is drunk fresh and some times sour (fermented) (Garis) or with tea (Sbanes). Processing and manufacturing of camel milk in to milk products like butter, ghee, cheese, ice cream, etc, not found except in some limited research. It was concluded that the production system and dairy production of camel in Sudan regrettably received little attention.

Key wards: Sudan · Camel · History · Population · System · Milk yield

INTRODUCTION

Sudan is a very large country, occupies 2.505.813 square kilometer of territory. The grazing lands constitute 40.4% from total Sudan area. The pastoralists of Sudan own 90% of the national herd of livestock [1].

Sudan ranks first among the Arab countries and second in Africa with respect to animal population. Also, is considered as the second country in the world in camel's population. According to recent estimates of livestock, there are about 40 million heads of cattle, 50 million heads of sheep, 43 million heads of goat and 4 million heads of camel [1]. Camels in the Sudan are spread in a belt configuration; it extends between latitudes 12-16 N [2]. This belt is characterized by erratic rainfall, less than 350 mm. Disease such as trypanosomiasis and the unsuitability of the clay soil prevented migration of camels in to the Southern part of the Sudan [3]. Camels in Sudan are concentrated in two main regions: the Eastern state, whereas camels are found in the Butana plains and the Red Sea hills and the Western Regions (Darfour and Kordofan). In Butana area of Sudan camels are commonly raised under nomadic conditions in a geographical zone, which lies approximately between latitude 14-16 N and longitude 33-36 E. Atbara River to the East, River Nile to the West and Blue Nile bind the area to the South and Southwest [4].

The rainfall in this zone is law to moderate. Vegetation consists of semi-desert grassland on clay in the north and on area of rich savannah with acacia thorn-land on dark cracking clay, alternating with grass areas in the South [5]. The country is home to some of

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Fig. 1: A bronze figure of camel found at Merwi [10]

the most well known camel nomads, the Kababish, Shukuria, Hadandowa, Lahaween, Rashaida and others. And the dromedary camel plays a significant role in the live hood of pastoral people, providing them with food and transport [4].

Despite the fact that camels are a major component of the agro-pastoral systems in vast pastoral areas of Sudan, little is known about their production systems and dairy production compared to other domestic animals. However, previous research conducted on camels dealt mostly with disease problems, reproductive physiology and characterization, information about production system and dairy production of Sudan camel are mostly limited and separated. The present study was initialed to highlight and collect literature review on history, population, production systems and dairy production of Sudan camel.

The History of Sudan Camel: Track of historical trends in the Sudan is difficult because of lack of reliable data [6]. The history of the dromedary camel in Sudan is even more obscure. It is believed to have entered the Sudan from Egypt. A specimen of camel hair rope of the old kingdom was found at Fayum in Upper Egypt, dating about 2980-2474 B.C., indicating that the animal had moved south by that period. In Sudan, the oldest evidence is a bronze figure of camel with saddle found at Merwi, (Figure 1) and estimated to date between 25-15 B.C., [7, 8]. Probably the camels entered the Sudan through the following routes: 1st North West Africa route during the 4th to 6th century, 2nd Egyptian route and 3rd Red Sea route (most recent) [9].

Camel Population: Sudan is rated the second in numbers of camel population in the world. Camels constitute 22% of the animal biomass in Sudan and 26.3% of the numbers of camel in the Arab world [11]. The last estimate of camel's population in the Sudan was about 4406 thousands head [1]. Table 1 shows the population of camels in the different states of Sudan. Growth rate of camel's herds in Sudan is 1.4% [12].

Table 1: Estimate of camel population in Sudan according to states [1]

State	Camel population	Camel population %
North Kordofan	1369825	31.09
South Kordofan	252023	5.72
North Darfour	546344	12.40
South Darfour	103100	2.34
West Darfour	394778	8.96
Elgadaref	228231	5.18
Kassala	593488	13.47
Red Sea	308861	7.01
Blue Nile	197389	4.48
Sennar	107947	2.45
Algezira	114115	2.59
White Nile	32604	0.74
Northern	45382	1.03
River Nile	105744	2.40
Khartoum	6168	0.14
Southern states (10 St.)	00	00.00
Total	4406000	100.00

Camel's Production Systems: For the nomads who inhabit the desert and semi desert regions in Sudan the camel plays important cultural, economic and social roles in the lives of these communities. In these marginal lands, stricken by recurrent droughts the camel is usually the sole survivor when all other types of livestock have succumbed. To those people camel herding is a way of life, an insurance against natural disaster and a highly valued cultural heritage. In Sudan three main types of production systems for camel herds are adopted. These are:

Traditional Nomadic System: This system is dominant in the geographical zone between 13°N to 16°N (Northern part of the camel belt) [13]. This is typically practiced by the Kababish tribe in Northern Kordofan State. The camel herders are continuously on the move in response to availability of grazing and water supplies.

Transhumant or Semi-Nomadic System: This system is found in eastern and southern regions of the camel belt and is practiced by semi-nomadic tribes [13]. In this system a degree of settlement is experienced during the rainy season where rainfed agriculture is practiced for stable food production and the crop residues provide feed supplement for camel populations [14].

Several tribes in Eastern Sudan practice a transhumant mode of range utilization [15]. They move from one area to another following certain migratory routes, e.g. the Rashaida spend the rainy season

(July - October) around Kassala and move about 400 Km to spend the dry season (March - June) in the southern fringes of their traditional zone in Doka area. Members of the Shukria, Lahaween and Kawahla tribes stay in Butana plains during the rainy season, either to the south (Gadaref) or to the southeast along the Atbra River course [4].

Sedentary or Semi-Sedentary System: This system is practiced in the eastern region of Sudan (East of River Nile and west of the Red Sea hills). It is also practiced in the agricultural areas in the central and southern parts of the camel belt [13].

Intensive System: In the past, this type of production was practiced in all camel area but it was limited for racing camel only (very small number of animals). Recently an intensive system of camel meat and dairy production exists as a kind of commercial investment in Khartoum state.

Camel Milk: In many arid areas, camels play a central role as milk suppliers. The comparative advantage of the camel as a dairy animal over the other species in the same environment is difficult to quantify; however, it is widely recognized that in absolute terms, the camel produces more milk and for a longer period of time than any other milk animal held under the same condition [16]. Furthermore, in Sudan camel's milk constitutes the sole diet of camel herders for considerable periods and they rely completely on camel's milk for more than month with out having drinking water especially during the migratory routes [3].

Milk Letdown: In camel, the presence of the calf is considered imperative for milk let down and hand massaging is also used to enhance this response [16]. Milk letdown in Sudan Camel is easily noticeable after a short period of suckling (1.5-2 min) when the teats suddenly swell, becoming much larger [17]. If a calf dies, the dam dries up if milking is not stimulated. The nomad makes what look like a doll (bao) from the skin of the dead calf, to tricks of the dam. It is sufficient for the dam to see and smell the doll of her calf for milk secretion to be stimulated.

Milking Procedure: Camels in most pastoral societies of Sudan are milked by men except in Rashaida tribe women can practiced milking of camel. Before milking, the calf is allowed to suckle until the milk starts to flow and the camel can be milked. Because of the height of the udder the milking is done standing. The milker stands on one leg and balances the milking bowl on his bent left leg. The left hand holds the bowl, while the camel is milked with the right hand. Some times both udder halves are milked at the same time by two herdsmen. To prevent calves from suckling at pasture during the day it is common among the nomad, to tie up one or more teat with special strings (using tape of goats or cows leather with narrow and small part of wood). Machine milking not practiced till now [17].

Milk Yield and Composition: Data on the actual amount of milk produced by Sudan camels are not very accurate for judging the milk yielding capability. Mainly because camels exist in desert areas with difficult accessibility, calve are still suckling and, therefore, the actual volumes of milk secreted are higher than the figures presented among the different herds studied. On the other hand, milking frequency varies among the different camel nomads [17]. Camel may be milked twice a day among the Rashaida tribe. And from two to five times or more among the other nomads [17].

In Sudan camel, average milk production was 5-10 kg/day [3], less than these, reported in three herds of Western Sudan camel, the mean daily milk yield was 2.36 liters [14]. On the other hand, camel milk yield in Butana area can reach 8 liters per day in the rainy season and good conditions, but at the end of summer the amount of milk decreases to 1.38 liters/day [9]. Recent figures on milk yield from different camel regions presented in Table 2. Milk composition percentage of Sudan camel was presented in Table 3.

Utilization of Camel Milk: Before 2006 the consumption of camel milk was limited to only the pastoral nomads and the paid of camel milk considered as shameful thing and taboo. But, recently, small amount of camel milk is commercialized and sold in some urban areas. Most of the camel milk in the Sudan is drunk fresh and some times sour (fermented) (Garis) or with tea (Sabanes). Others method of processing and manufacturing of camel milk in to milk products like butter, ghee, cheese, ice cream, etc ….., not found except in some limited research.

In conclusion, Despite the large numbers of camel population in Sudan, the consumption of fresh camel milk and traditional milk products are limited to only the pastoral nomads. However, the main constrains of camel dairy production sector attributed to the poor production system and lack of milk processing technologies.

Table 2: Milk production and lactation length of Sudan camel according to main camel regions [18]

	Milk production (liter)				
Regions	Beginning	Middle	End	Total	Lactation length (month)
Sinnar	7.38±2.19	4.63±1.37	2.18±0.84	1508±533	10.54±1.64
Gedaref	7.10±2.57	4.70±2.96	2.22±1.15	1656±756	11.78±0.63
Gezira	6.39±1.94	4.12±1.42	2.38±0.87	1515±465	11.77±0.60
Kordofan	5.83±2.84	4.17±2.19	2.86±2.11	1489±750	11.72±0.84
Overall	6.72±2.54	4.63±2.27	2.41±1.42	1557±672	11.48±1.12

Table 3: Milk composition % of Sudan camels:

Fat	Prot.	Lacto.	T.S	Ash	Mois.	Reference
3.15	2.81	4.16	10.95	0.83	88.33	[3]
3.36	3.41	3.60	10.9	0.81	89.26	[14]
3.72	3.84	-	-	0.71	88.67	[9]
3.31	3.38	3.25	10.44	0.59	90.42	[17]

REFERENCES

1. Ministry of Animal Resource, 2008. Dept. of statistic and information, Khartoum - Sudan.
2. Wardeh, M.F., 1989. Arabian Camels: Origin, Breeds and Husbandary. Al-Mallah Publ., Damascus, pp: 500.
3. Agab, H., 1993. Epidemiology of camel diseases in Eastern Sudan with emphasis on brucellosis, pp: 184. M.V.Sc. thesis. Faculty of Vet. Medicine. U. of K. Khartoum - Sudan.
4. Al-Amin, F.M., 1979. The dromedany camel of the Sudan. In: camels IFS. Symposium, Sudan, pp: 35-53.
5. Abu-Sin, M.E., 1970. The Regional Geography of the Buttana. M.Sc. Thesis.U. of K. Khartoum- Sudan.
6. Ramet, J.P., 2001. The technology of making cheese from camel milk (*Camelus dromedarius*). FAO. Animal Production and Health Paper; pp: 113.
7. Adison, 1934. A short guide to the museum of Antiquities, Khartoum National History Museum, Sudan.
8. Robinson, A.E., 1936. Between the third and sixth dynasty. Sudan Notes and Records, 19: 47-69.
9. Salman, M., 2002. Some husbandry aspects in the Butana area in Eastern Sudan. M.Sc. thesis faculty of Animal Production. University of Khartoum, Sudan.
10. Sudan National Museum, Khartoum- Sudan.
11. Sakr, I. and A.M. Majid, 1998. The Social Economics of Camel Herders in Eastern Sudan. The Camel Applied Research and Development Network/ CARDN/ACSAD/, 30: 1-27.
12. Babiker, S.A., 1988. Studies on Camel Meat. Abstr. In: International Symposium on the Development of Animal Resources in Sudan, 1-3, 1988. Khartoum-Sudan, pp: 14-15.
13. Al-Khori, F. and A.M. Majid, 2000. Camels in Sudan: Ecolology, Production Systems, Characterization and Herd Dynamics. The Camel Applied Research and Development Network CARDN/ACSAD/Camel/ P96/2000, Damascus.
14. Bakheit, S.A., 1999. Studies on milk production and composition of camels (*Camelus dromedarius*) under nomadic system. M.Sc. thesis. Faculty of Animal Production, University of Khartoum, Sudan.
15. Abbas, B., N. Chabeuf, G. Saint-Martin, P. Bonnet, A. Millairid, H. Bashir and M.E. Musa, 1992. Camel Pastoralim in Butana and Northern Sudan. Nomadic People, 31: 64-84.
16. Farah, Z., 1996. Camel milk properties and products (SKAT). Swiss federal institute of Technology ETH-Zentrum, LFO, CH-8092 Zurich, pp: 67.
17. Eisa, M.O., 2006. Udder conformation and milkabilty of she-camel (*Camelus dromedarius*) in EL- Showak, Eastern Sudan. Ph.D. thesis. Faculty of Animal Production, University of Khartoum.
18. Ibrahim Ali Ishag Mohamed, 2009. Production system, Phenotypic and Molecular Characterization of Sudanese Camels (*Camelus dromedarius*). Ph.D. thesis. Faculty of Animal Production, University of Khartoum.