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CAMEL–A POTENTIAL DAIRY ANIMAL IN DIFFICULT ENVIRONMENTS

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Camels were originally domesticated for their milk. Following the move to use the camel as a beast of burden especially for armies, there has been a return to its original task. Camel is no more the animal of the old world, but an animal which may be use to combat the growing desertification and to feed millions of people living in those areas. There are many scientific data concerning the anatomy, physiology and endocrinology of lactation in camels. It has been shown that camels can provide 15-20 liters of milk per day for a lactation period of up to 18 months, making it a very good farm animal. The camel produces in harsh and hostile conditions where other *animal may not survive.* Studies conducted in the horn of Africa revealed that the camel produced more milk than the other types of tropical animals compared on the basis of kg/TLU/year. Camel milk is now used in the modern urban masses and found in the shelf of the super markets and shopping malls in the form of plain and flavored milk, cheese and chocolate. Globally camel produces about 2 % of the world total milk and that milk is mostly produced by pastoral people and consumed locally. Some attempts have been made to market such camel milk after collection and pasteurization in central processing unit/factory (India, Kenya, Mauritania and now in U.A.E.). There is a weak knowledge about the true potential of the camel and very rare references are available in the scientific database especially on various quantitative traits like daily and lactation yields and the factors affecting on it. In Pakistan camel population attain one million head with almost 20@ of lactating camel produces around 0.6 million ton of milk annually, but had never documented as independent entity in the grey records of the country. Per head basis camel in the country produces far better than the indigenous milch breeds of cattle and buffalo, Friesian and their crosses. The camel sustain its productivity in difficult conditions and comparatively lesser affected by the adverse factors like lack of feed, water, season and length of lactation. There is a wide diversity of breeds in the camel found in the arid and semiarid lands (ASAL) of the world. An enormous production variation has been observed in the different individuals of the same breeds, between the breeds and areas to area. This variation can be use successfully in the future strategies of the milk improvement. The time has reached to know and exploit the true potential of camel and to find the ways to sustain this old industry for the cause of the conservation of important animal genetic resource and transform it in a modern entrepreneur in the near future.

Keywords: Camel, milk yield, environment, breeds and Pakistan

INTRODUCTION

The camel has been serving millions of people living in the arid, semi arid and desert areas of world. It provides food, fiber, transportation and social status to the herders. A few attempts have been done in health, nutrition,physiology and reproduction, camel productivity *per se* is still relatively untouched. A lesser and even neglected amount of milk is published in the gray records of the country. The camel milk has never been appreciated, valued and estimated properly (Younas and Iqbal, 2001). Importance of this specie demands that separate estimates should be collected to fully realize the exact potentials of camel as milch animal and to place camel where it needs to be. This will further help the scientists to suggest the significance of camel in the changing global scenario and to proper develop and manage the niche that harbor this specie.

Camel possesses certain physiological features that enable him to thrive in extremely arid environment. Dromedaries use water economically in almost all metabolic functions. The body temperature of the animal can fluctuate between 93º and 105º F; therefore, sweating is reduced. They don't over heat, can withstand water loss, and store fats in the hump for use in times of food and water deprivation

Camel is a quality and variety browser. If the good quality forage is not available, the camel then can efficiently utilize poor quality forage with higher crude fiber, more than the other herbivores, by increasing the retention time of the fiber in the fore stomach for longer time up to 74 hours. On the other hand, if feeding on low-protein forages can recycle and utilize body urea for microbial protein synthesis much more efficiently than the true ruminant (Schwartz and Dioli, 1992). By virtue of these attributes and potentials, the role of camel as food animal is being accepted globally and the camel scientists (Faye and Esenov, 2005) state that camel has unfathomed potential for satisfying human's future dietary and medical needs.

Camel milk production is stable in almost all seasons, which is very important for the pastoralist, when the milk of other animals is seized in the dry period. As camel intake per kg of milk produced is very less, it will be suitable specie to be maintained even on marginal and poor grazing lands. According to some reports, camels need only 1.9 kg of dry matter to produce a liter of milk, compared with 9.1 kg for cows (Stiles, 1983). Therefore a review study of the available information on the ability of camel as milch animal was conducted to know the actual worth and future role of camel as dairy animal.

CAMEL GENETIC BIODIVERSITY

Camel posses vide genetic biodiversity and there are many breeds of camel in the arid and semi-arid areas of the world. Each breed has been developed by their own perspective pastoralist community for their own breeding goals. Some camel breeds were developed for the work hence they are good draught animals. The camel evolved for the long traveling in the desert in caravans are now good race animals. Some other breeds were developed for the food production especially milk in the harsh environment and now these breeds are good milch animals

have been reported first time by Raziq and Younas (2006).

MILK PRODUCTION

Camel was originally domesticated for milk. God gifted cow camel to Prophet Saleh some 3500 BC back to drink the milk only. The camel's milk was a gift from God for the Arab Bedouins. In the Holy Quraan the true worth of the camel has been described. According to Khan (1974), the desert dwellers when turned to God in complaint about the climate and lack of food, God heard their pleas and came to their aid; "He sent them the she camel to drink her milk and they became well". Pakistani camel has excellent potential as milch animal including, Marecha, which is probably the best milk yielder in the world with an average milk yield of 4,179 liters per year (Sial, 1950). On average daily milk yield is from 8 to 10 liters but under intensive management conditions milk yield is from 15 to 20 liters daily. However, some specimens have been reported to yield as high as 40 liters per day (Qureshi, 1986). Experimental studies carried out in Pakistan on its different aspects of milk and its products are scarce. However, results of some studies are given in the Table 1. The scientists from Sindh, Baloch, (2001)

Table 1. Production potential of Pakistani camel

Source	Average daily yield (ltr)	Lactation length (mo)	Lactation yield (ltr)
Sial (1950)	–	–	6688
Yasin and Wahid (1957)	10-15	16-18	2721-3629
Leopold (1978)	8.3 (6.7-10.0)	9-18	2700-3600
Knoess *et al.* (1986)	18.7	–	6688
Qureshi (1986)	8-10	–	–
Schwartz (1992)	--	9-18	12000
Jasra and Aujla (1998)	4-12	9-18	1250-3650
Iqbal *et al.* (1999)	(11.66)	12	4260
Baloch (2001)	4.25	15	1894.93

Earlier workers (Qureshi, 1986) narrated 4 breeds (Bagri, Brela, Marecha and Mountain camels) in Pakistan, stating that Marecha was the best milk producer. Isani and Baloch (2000) have listed about 21 breeds of camels in the country. They have classified them according to their habitats, production pattern, body measurements, physiological norms and their particular characteristics. An update of the breeds of camel has also been mentioned. White camels (Kohi)

reported that the average milk production of Pakistani camel was 1894.93 liters per lactation, with the daily yield of 4.25 liter. This figure indicates the variability in the production potential of different camel breeds. Different breeds having different vigor, under different ecological conditions for different traits provide plenty of scope of improvement in camel potentials.

Camel milk is an essential diet of nomads in the desert areas. Camel milk is sold in the nearby cities. Some herders sell camel milk as pure, while others mix with milk of cattle and buffalo, especially in the peak

season, when the milk production of other animals go down. The milk yield although varies under different production systems and nutritional management regimes, an elite female camel may yield up to 10-15 liters daily on an average and thus may do extremely well than exotic cow in tropical environment in its performance as dairy animal. When the camels were well fed, there was an average milk yield of 10–15 kg per day (Yasin and Wahid, 1957). In the areas with poor feeding and under desert conditions, the daily average was 4 kg. Contrary to cattle, average daily yield maintains up to at least 1 year provided fodder and feed are adequate.

According to some researchers (Knoess et al, 1986), camels produced more milk per kg body weight than Sahiwal cattle, Friesian×Sahiwal cattle and buffaloes. Also in a similar environment, camels produce more milk for a longer period of time than any other species, while their requirement for feed is modest (Wilson, 1998). It was further reported by Knoess and his co-workers (1986) that in Punjab, well-fed dromedary camels produced more milk than even high-merit exotic cattle and their crosses. They thrive in areas where green fodder is only seasonally available as a result of erratic rainfall, and can survive on feeds left by other animals (Knoess, 1977 and Yagil, 1994). The efficiency of the camel should be appreciated in terms of its productivity parameter as well as with respect to its superb adaptation to a harsh environment, sustainability of production across seasons, and accessibility to people living on marginal lands. The milk production and the economic benefits of camel milk were explored by (Jasra and Aujla, 1998). They reported that the economic benefits of camel products (milk, meat, etc.) are not apparently visible. However, the domestic value is considerable. As high as 22 liters of milk were daily obtained from a few she camels in Balochistan. They reported that the daily milk yields varied from 4 to 12 liters, the lower milk yields attributed to poor feed supplies.

Recent studies conducted on the milk production potential on Kohi camel of northeastern Balochistan proved that the mountainous camel produces an appreciable amount of milk. Table 2 indicates the potential of Kohi camel under the ordinary grazing system on the rangelands.

Table 2. Milk yield and lactation length in different parities of Kohi camel

Parity	No. of camels	Mean age (years ± SE)	Daily milk yield (kg ± SE)	Lact. length (days ± SE)	Lactation yield (kg)
1	3 (7.5%)	4.5^{d} ± 0.32	6.0b ± 0.38	259 ± 8.08	1566
2	9 (22.5%)	7.3^{c} ± 0.88	8.8^{ab} ± 0.68	231 ± 24.64	2029
3	6 (15.0%)	8.8^{c} ± 0.17	11.1^{a} ± 1.21	275 ± 2.34	3051
4	10 (25.0%)	11.4^{bc} ± 0.76	11.0^{a} ± 0.69	273 ± 4.58	3010
5	4 (10.0%)	13.5^{b} ± 0.29	11.7^{a} ± 1.79	270 ± 4.06	3168
6-8	8 (20 0%)	17.4^{a} ± 0.50	11.0^{a} ± 0.79	248 ± 18.62	2719
Total/Mean	40 (100%)	10.5 ± 0.34	10.2 ± 0.43	259 ± 7.02	2590.5

Means sharing different superscripts in a column are statistically significant ($p<0.05$)

LACTATION LENGTH

Lactation length of she camel depends upon various factors and varies from 9 to 18 months (Qureshi, 1986). The mainly available food item for the pastoralists is the milk of she-camel; therefore, they do not dry the animal, which results in the lengthy lactation period, even higher than 18 months. However according to some researchers, the milk yield and lactation length of Pakistani camel averaged 1894.93 liters and 445.58 days (15 months), respectively (Baloch, 2001). Farmers reported a lactation length of 270 to 525 days (9-18 months) with a the total milk yield ranging in between 1,250 to 3,650 liters with an average of 1,800 liters per lactation (Jasra and Aujla, 1998). The authors (Raziq, 2004) have observed that the causes for different length of lactation probably are due to the breeders control, fluctuations in vegetation, long prevailed drought in the last decade (1996-2002) and poor managemental practices of different areas. In northeastern Balochistan the lactation length is being controlled by the herders and dries the cow at the 8-9th month of lactation. This practice is done to harvest more calves in the life span of the cow. The lactation length of Kohi camel is presented in Table 2.

MILKING PATTERN

The mainstay of a nomad's food is camel milk. It is consumed fresh or soured. In the northeastern mountainous area of Balochistan, both regular milking of two times daily and milking when needed, both

systems are practiced simultaneously (Raziq, 2004). According to Jasra and Aujla, (1998), she camel was milked twice a day, while young calves were weaned at an age of 9 to 11 months. The camels are milked twice in 24 hrs but 4 times milking is also not uncommon. The camel has a unique capability that it can be milked any time during 24 hrs and six times milking has also been noticed in some animals (Qureshi, 1986), that excited many workers to initiate some studies on the hormonal profile of this specie and the letdown mechanism.

CAMELS MILK PRODUCTS

A wide range of products are made from camel's milk such as various sour milks, cheese (kurth), khoa, butter and ghee, etc. Despite common belief in south Asia that camel milk cannot be used to prepare butter and ghee due to the small diameter of fat globules, some local and foreign workers have devised methods to make butter and ghee successfully (Sial, 1950; Qureshi, 1986 and Knoess et al. 1986). Most common milk products made from camel milk are dahi (yoghurt), lassi (sour milk) and kurth (cheese) in northeastern Balochistan habitats.

There was a general belief that butter couldn't be made out of camel's milk. But for the first time in the history of Livestock and Dairy Development Department Punjab, 175 gm of butter out of 4 liters of milk was obtained (Qureshi, 1986). The detailed procedure has been detailed out and further narrated by the authors (Younas and Raziq, 2005). The Kurth is a name given to local cheese, white in color, which is a hard rounded piece of the dry matter of whey. Camel lassi is sieved through muslin cloth, total solids are filtered and some salt is added for taste development and further preservation. It is further dried in the sun to make hard balls. It is used as such or again changed into lassi when needed. The lassi of kutrh is also used for making a dish (*The Kurtho Marrie*). The pieces of bread are soaked with kurth solution and then eaten after pouring the desi ghee on it (Raziq, 2004).

EPILOGUE

The camel could not get much desired attention due to many reasons and lack of awareness about its attributes relating to its milk production and its products. Due to prevailing droughts and decreasing production trend of other animals, the camel has gained much attention to abridge the gap of demand and supply. The decreasing population of the camel demands that factors contributing towards its decline need to be taken care of. The recent studies have shown that the camel is a big candidate, which can meet the milk requirements of the pastoral people and as well as other population if managed, bred and fed properly. Furthermore in the changing and global warming scenario, under-exploited species like camel will find a better place to thrive and produce even under harsh climatic conditions. A lot of virgin areas of research and development in this specie demand, that proper milk recording, selection and breeding practices are to be taken to exploit its genetic potentials to its maximum. Some planned and integrated efforts are needed in camel concentration areas of Cholistan and Balochistan to undertake research and auxiliary developments on this specie and its allied disciplines. It is expected to bring revolutionary changes and further improvements in enhanced milk production to put smile on the faces of the camel herders by improving their pastoral economy.

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