

MILK PRODUCTION POTENTIAL AS AFFECTED BY PARITY AND AGE IN THE KOHI DROMEDARY CAMEL

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ABSTRACT

The dromedary camel is a milk producing animal but its potential as a dairy animal has not been thoroughly evaluated. This study comprises 40 lactating camels of Kohi breed, selected from pastoral herds in northeastern Balochistan, Pakistan. Sampling was performed in 2006, every 15th day during one lactation period (259±7 days). The daily milk yield ranged from 6.1-11.7 kg with a mean daily yield of 10.2±0.4 kg/day. Parity and age of the camels affected the milk yield. The highest milk yield 3168 kg was demonstrated in the 5th parity (13.5 years), followed by 3051 kg in the 3rd parity (8.8 years) and 3010 kg in the 4th parity (11.5 years). The lowest milk yield was 1566 kg produced in the 1st parity (4.5 years) (p<0.05). The study demonstrates the dairy potential of Kohi dromedary camels in traditional pastoral management.

Key words: Balochistan, dairy, lactation, Pakistan, pastoral, Suleiman

Performance data on camel milk production in pastoral herds are very scarce, but Raziq *et al* (2008a) showed that camels have a very good dairy capacity and can produce 15-20 kg milk per day during a lactation period of 8-18 months, under harsh conditions where milk production in other farm animals is severely impaired. The camel can produce more milk than the cow under such conditions (Faye, 2005). In general, about 20% of a breeding herd consists of lactating camels with an average yield of 3000 kg per lactation (Raziq *et al*, 2008a).

The Balochistan province contains 46% of the Pakistani camel population and 5% of the human population. The camel is used by pastoral people for transportation and hauling and food (milk) production (Aujla *et al*, 1998). The milk yield under these adverse conditions differs in quantity from area to area and ranges from a few kg to 35 kg per day (Yagil and Etzion, 1983), however, the camel milk productivity is not well documented in Balochistan. There is high consumer preference of camel milk in the province of Balochistan and the herders usually use camel milk with the local made bread (*Kak*).

This study was conducted to obtain knowledge about the milk production potential of camels under ordinary grazing conditions of the Suleiman mountainous region in the northeastern Balochistan.

Materials and Methods

The study was conducted in the Suleiman mountainous region, in northeastern Balochistan. Summer temperature ranges from 21-32°C and winter temperature is below 0°C (GOB, 1999).

Freely grazing (no supplementation except 250 g common salt/week per camel) Kohi camels (n=40) from pastoral herds in Musakhel District of Balochistan were selected for this study. The initial milk samples were collected at the end of first week of lactation. The sampling was then continued every 15th day during the whole lactation period. It was difficult to measure the daily milk yields under pastoral conditions because of the remoteness of the area, the constantly moving herds, the milking practices (milking once, twice, or even 6 or 7 times per day, due to needs) and the presence of nursing calves.

The camel cows were regularised 36 hours before sampling, udder cover was applied and milking was practiced on equal intervals (12 hours). After 36 hour the milk was collected morning and evening with equal interval of 12 hours. The camels were milked in a container used by the herders. Before milking, calves were allowed to suckle for a few seconds to stimulate milk letdown. The calf was then restricted to the two teats on the right side while a handler milked the two teats on the left

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side. The milk foam was allowed to liquefy for 30 minutes and the milk volume was then measured in a ml-graduated cylinder. One litre was set equal to 1 kg. The total milk yield was calculated as the actual yield multiplied with two, since two teats were suckled by the calf. Data collected were analysed using Minitab 12.21, 1998 software and General linear model (ANOVA) for variables (parity and age of the cow) affecting daily and lactation milk production.

Results and Discussion

Milk yield and lactation period of the camels are shown in Table 1.

The mean daily milk yield in the present study ranged from 6.0-11.7 kg/day with a mean of 10.2±0.43 kg/day ($p<0.05$). Milk yield in the dromedary camel reported in the literature varies within a wide range. Other studies from Pakistan reported a daily milk yield of 3.5-13.5 kg/day (Yasin and Wahid, 1957), 4-12 kg/day (Aujla *et al*, 1998), 6.7-10 kg/day (Leopold, 1978), 6.9-18.2 kg/day (Rao, 1974), 8-10 kg/day (Sial, 1950) and 15-35 kg/day (Knoess *et al*, 1986). Heavy riverine camels from the irrigated belt in the Punjab province produced more milk than the mountainous breeds, like the Kohi camel.

Compared to most of the African camel breeds, the Kohi camel produce more milk. Studies from African countries reported 3.2-5.4 kg/day in Ethiopia (Reta and Mekonnen, 2002), 3.5-4.5 kg/day in Egypt (El-Bahay, 1962), 4.5-9.1 kg/day in Tunisia (Burgemeister, 1974), 4-7 kg/day in Kenya (Mehari *et al*, 2007), 8.3-10 kg/day in Libya (GEFL, 1977), 5.0 and 3-10 kg/day in Somaliland (Yagil, 1982; Farah *et al*, 2004).

Scientists in India (Raghvendar *et al*, 2005) and UAE (Wernery *et al*, 2004) reported daily milk yields

Table 1. Milk yield and lactation period in different parities.

Parity	No of camel	Age in years (mean±SE)	Daily milk yield in litres (mean±SE)	Lactation period in days (mean±SE)
1	3 (7.5%)	4.5 ^d ±0.32	6.0 ^b ±0.38	259±8.08
2	9 (22.5%)	7.3 ^c ±0.88	8.8 ^{ab} ±0.68	231±24.64
3	6 (15.0%)	8.8 ^c ±0.17	11.1 ^a ±1.21	275±2.34
4	10 (25.0%)	11.4 ^{bc} ±0.76	11.0 ^a ±0.69	273±4.58
5	4 (10.0%)	13.5 ^b ±0.29	11.7 ^a ±1.79	270±4.06
6-8	8 (20.0%)	17.4 ^a ±0.50	11.0 ^a ±0.79	248±18.62
Total/ Mean	40 (100%)	10.5±0.34	10.2±0.43	259±7.02

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

of 6.0 kg/day and 8-9 kg/day, respectively, which is lower compared to the results in the present study.

The lactation period in this study ranged from 231-275 days with a mean of 259±7.02. Other studies from the mountainous areas of Pakistan reported 270-330 days (Aujla *et al*, 1998) and 270-540 days (Leopold, 1978). Various studies from the plain areas of Pakistan usually report longer lactation periods, like 270-540 days (Schwartz, 1992), 360 days (Iqbal, 2002) and 450 days (Baloch, 2001). Studies from African countries report longer lactation periods compared to our findings, e.g. 360 days (Reta and Mekonnen, 2002; Mehari *et al*, 2007), 360-540 days (Farah *et al*, 2004 and 2007), and 390-450 days (Belay and Getahun, 2002). Long lactation periods are especially reported from the Horn of Africa, where the majority of the pastoralists are Somali camel herders, who primarily depend on camel milk for their living. Most of the husbandry and the management practices of the Somali camel herders are geared to improved milk production and a continuous supply throughout the season of milk for the family needs (Farah *et al*, 2004). Lactation periods of 300 days by Wardeh (1994) and 330 days by Wernery *et al* (2004) from Middle East are also longer than in our study.

The length of the lactation period of the camel depends on various factors (Wilson, 1989), e.g. artificial lactation control, cow and calf status, availability of the vegetation and the decision of the herders. In our study, the lactation period was controlled artificially. The herders dry the camels at about 250 days of lactation to provide a reasonably long dry period before the onset of the breeding season, in order to gain more calves. In some parts of Pakistan, mostly the irrigated belt, camel herders solely rely on the production of milk (Qureshi, 1986). Therefore, they do not dry the camel cows, which results in longer lactation periods.

In this study, the camels were 4-20 years old and have parity 1-8 (Table 1). The highest lactation yield (3168 kg) was demonstrated in 5th parity camels, followed by 3rd (3051 kg) and 4th parity (3010 kg). The lowest milk yield was demonstrated in 1st parity (1566 kg) camels. An effect of parity on milk yield was also reported by Yagil (1982), Simpkin (1998), Kebebew and Baars (1998), Bekele *et al* (2002), Mal *et al* (2006) and Zeleke (2007), although their results differs. Yagil (1982) reported that Israeli 4th parity camels showed the highest mean daily milk yield, whereas camels in late parity had the lowest daily yield. Simpkin (1998) showed that the lactation yield

from 1st parity camels was much lower than during the subsequent lactations. Kebebew and Baars (1998) showed that the milk yield from 4th and 5th parity camels was significantly higher than from later parity camels. Bekele *et al* (2002) showed that in camels in eastern Ethiopia the peak daily milk yield was recorded from 3rd-5th parity camels and the lowest yield from 1st and 7th parity camels. Mal *et al* (2007) showed that in camels in India the daily milk yield was highest in 3rd parity, followed by 1st and 2nd parity. Zeleke (2007) showed that in camels in Kenya, 3rd parity produced more milk compared to 1st, 6th and subsequent parities.

Low milk yield in 1st parity is logical, when the camel is still growing and the nutrient requirements for body growth are high. Reduction of yield in 6th and subsequent parities may be due to wear of teeth, reduction in the number and potency of milk secreting cells, and general weakness due to old age.

Female Kohi camels reach puberty at 3 years of age. The conception rate is 85% and the calving rate is 80%. The gestation period is 375-385 days and the calving interval is 2 years. The reproductive duration is 25-35 years (Raziq *et al*, 2008 b). The first calving in Kohi camels is early in life, therefore, the cow reach peak production in later parity compared to many African camel breeds. The camel matures at the age of 12, and at this age the Kohi camel is in 4th parity, while in the same age African camel is in 3rd parity.

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Comparative analysis of the heme binding pockets of three homologous hemoglobins: Camel hemoglobin specification

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In this study, comparison have been made among three homologous hemoglobins; human (HHb), bovine (BHb) and camel (CHb), for their representative susceptibility to oxidation. The order of their susceptibilities was observed to be as CHb>HHb>BHb. Hemoglobin of camel is more prone to be oxidized than the next two homologues. Since three dimensional structure of the CHb has not yet resolved, using molecular simulation approach the structure of the CHb was simulated and resulted coordinations were verified. Then, looking for the source of observed differences on heme to heme conversion, docking analysis were directed to heme binding pockets and LIG-plots were constructed for the three heme binding pockets. Interestingly, more hydrophobic environment was resulted for heme pocket in CHb than the next two molecules and pocket hydrophobicity seems to be well correlated with oxidation susceptibility.

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