



## Short Communication

# Milk Yield and Composition of Barela Dromedary Camel in Thal Desert Punjab, Pakistan

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### ABSTRACT

Barela is very important dairy breed of Punjab having prominent milk vein. The present study was conducted to check its milk production and composition in Thal desert. With an average milk yield of 7.38 liter under traditional management, Barela camel appears as a camel breed with a good dairy potential. Moreover, according to its gross composition (fat, protein, lactose, SNF and total solids percentages being 4.26, 3.62, 4.84, 9.02 and 13.28, respectively), Barela milk appears particularly rich compared to literature data. A long term monitoring, notably throughout the lactation, could be a good opportunity to assess the potential of this breed at national level.

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#### Authors' Contribution

AF conducted research and wrote the paper. AW helped in analysis. MSN helped in conducting experimental work. RHM and HMI helped in writing of article.

#### Key words

Camel milk, Dromedary camel, Pastoral system, Composition of camel milk.

Camel is said to be a good producer of milk and it is an important source of income especially for people of arid, semi-arid and desert areas. Its milk contains higher values of vitamin C (Konuspayeva *et al.*, 2011) and is an important source of food in the pastoral community (Saini *et al.*, 2007). Due to its special attributes, camel is considered as the animal with unfathomed potential to meet the future dietary and medical needs of human beings (Faye and Esenov, 2005). Therefore, it is need of the time to explore its production potential under natural habitat as camel has genetically excellent potential for milk production along with its longer lactation period (390-410 days) than other ruminants. Their feed requirements are also comparatively less than other dairy animals. Camel dairy production is particularly important in the desert areas where camels are the only source of milk (Farah and Fisher, 2004).

Milk yield varies with the age, breed, management conditions, feeding and stage of lactation. Under pastoral conditions it is very difficult to estimate the daily milk yield of camel. Because the calves suckle their dams throughout the lactation period and the variation in the milking frequencies among various pastoral groups. Under traditional pastoral management system camel produces more milk than any other type of domestic animal species. The Barela camel used as a beloved companion and a good producer of milk and meat. It produces milk in harsh and hostile

conditions with ample high temperature and scarcity of feed and water. So, this characteristic enables camel herders to live in deep desert and use the milk as food security (Ali *et al.*, 2009). Keeping in view the above discussion, the current study was planned to evaluate the milk production potential and quality of Barela camel in its natural habitat (pastoral system).

#### Materials and methods

Thal desert comes under the agro ecological zone-III. Sandy deserts having narrow strips of sand ridges and dunes while the climate is arid to semi-arid with mean summer temperature goes up to 45.6°C and in winter it falls from 5.5 to 1.3°C. Mean annual rainfall ranges from 150-350 mm, increasing from south to north (Rahim *et al.*, 2011). A total of 100 households, who owned adult Barela she-camels were selected using purposive sampling technique. All animals were carefully examined before the start of milk recording and those included who were found physically healthy. The animals of 3<sup>rd</sup> to 5<sup>th</sup> parity in early and mid-stage lactation were selected. All animals were milked twice daily on equal time intervals. The animals suckled by their calves so one right side was offered to the calf and left side was milked then multiplied by 2 to get the morning/evening milk production. Before milking the udder was washed with luke warm water and dried with clean towel, post milking teat dipping was also performed for hygienic milking. For milk composition, all animals were carefully examined before the start of sampling and those were found physically healthy, milked twice a day (morning and evening), thoroughly mixed the

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milk and their samples were collected and examined in duplicate. The milk samples (morning + evening = 200) were collected in sterile plastic bottles and transported to Dairy lab; Camel Breeding and Research Station (CBRS) Rakh Mahni and analyzed. The determination of milk composition included fat, protein, lactose, SNF and total solids were estimated by using Milky Lab Analyzer. The animals were allowed grazing/browsing daily for 10 h. The animals were watered twice a day. Microsoft Excel (Microsoft Office 2010) was used for data compilation and analysis.

### Results and discussion

In present study the milk production of Barela she-camel was found to be  $7.38 \pm 0.27$  and ranged between 3-9 liters in 3<sup>rd</sup> to 5<sup>th</sup> parity animals in early and mid stage of lactation under extensive management system (Table I). In a very recent study, Faraz *et al.* (2018) reported the daily milk yield of Marecha she-camel in Thal desert Punjab, Pakistan as 5.62 kg in extensive management system. These Marecha she-camels were also in early and mid-lactation stage, in 3<sup>rd</sup> to 5<sup>th</sup> parity and reared under pastoral system in Mankera Tahsil of District Bhakkar. A wide range of 3.5-40 kg daily milk yield was reported by Khan and Iqbal (2001) after extensive review of literature in various breeds of Pakistani camel in different stages of lactation and parity. Farah and Fisher (2004), Ali *et al.* (2009) and Ahmad *et al.* (2010) reported range for daily milk yield of Pakistani camel as 3-10 kg in different stage of lactation and parity and this supports the findings of current research. Raziq *et al.* (2010) studied milk production of Kohi dromedary camel as affected by age and parity in mountainous areas of Balochistan and reported mean daily milk yield as  $10.2 \pm 0.43$  kg. They reported 6 liters daily milk yield in 1<sup>st</sup> parity with 4.5 years average age in group of 3 camels, 8.8 liters in 2<sup>nd</sup> parity with 7.3 years mean age in group of 9 camels, 11.1 liters in 3<sup>rd</sup> parity with 8.8 years mean age in group of 6 camels, 11 liters with 11.4 years mean age in group of 10 camels, 11.7 liters with 13.5 years mean age in group of 4 camels and 11 liters with 17.4 years mean age in group of 8 camels reared under extensive conditions.

Melaku and Fesha (2001) and Bekele *et al.* (2002) reported 2.5 liters and  $4.14 \pm 0.04$  kg daily milk yield in Ethiopian camels in extensive conditions. Eisa and Mustafa (2011) reported range for milk in Sudanese camel as 5-10 kg/day in different stage of lactation and parity numbers. Kamoun and Jemmali (2012) studied milk yield of Tunisian camel and reported average daily milk production as  $6.72 \pm 2.46$  liters. Nagy *et al.* (2013) studied milk production of dromedary camels under intensive management in United Arab Emirates and reported average daily milk yield as  $6 \pm 0.12$  kg. Current study findings are

very close to the results of Gedlu (1996), Kebebew and Baars (1998) and Tezera (1998) who reported range from 4.5-7.5 liters of milk per day in Eastern African camels while in contrast with the findings of Zeleke and Bekele (2001) who reported range as 1.5-3.1 liter/d in Ethiopian camels under extensive management conditions.

Finally, compared to the available literature data, Barela camel breed appeared as a good dairy camel with a relatively good dairy potential. However, the measurement procedures are rarely mentioned or set up in a standard manner and can change among authors. Moreover, the available publications give some results as daily average quantities, total lactation yield or year yield, herd average, after camel calf suckling or not. Therefore, the comparisons between authors are not easy (Faye, 2004), and must be accepted with caution.

**Table I.- Milk yield (liters) and composition (%) of Barela she-camels in Thal desert, Punjab.**

Parameters	Average	Range
Milk yield (M)	$4.12 \pm 0.13$	3-5
Milk yield (E)	$3.26 \pm 0.18$	2-5
Milk yield (total)	$7.38 \pm 0.27$	3-9
Fat	$4.26 \pm 0.36$	3.88-4.70
Protein	$3.62 \pm 0.06$	2.66-4.02
Lactose	$4.84 \pm 0.08$	3.67-5.04
SNF	$9.02 \pm 0.09$	7.62-9.87
Total solids	$13.28 \pm 0.06$	12.22-14.65

Milk fat and protein percentage of Barela she-camel were found to be  $4.26 \pm 0.36$  and  $3.62 \pm 0.06$  (Table I). Raziq *et al.* (2011) studied milk composition of Kohi camel in Balochistan, Pakistan; they sampled 6 she-camels in initial and late stage of lactation in extensive conditions and reported fat and protein percentages as 2.63 and 4.01, respectively. In a very recent study, Faraz *et al.* (2018) studied milk composition of Marecha she-camel reared under extensive management system in Thal desert, Punjab Pakistan and reported milk fat percentage as 4.44 during early and mid-lactation stage in 3-5 parity animals. Mal *et al.* (2006, 2007) reported ranges for fat and protein percentages as 2.50-3.30 and 3.75-3.92, respectively in Indian camel's milk. Mal and Pathak (2010) reported fat and protein percentages as 5.5% and 3.87%, respectively in Indian Bactrian camel's milk.

Kappeler *et al.* (1998) and Khaskheli *et al.* (2005) reported range of fat and protein percentages as 2.5-5.5 and 2.4-4.5 percent, respectively in camels in extensive conditions with different stage of lactation and parity. Present findings are in contrast with the findings of Elamin and Wilcox (1992) who reported 3.15% fat and 2.81% protein in milk of Majaheem camels in Saudi Arabia who

were raised on normal diet and were in different stages of lactation. Furthermore, Mehaia *et al.* (1995) reported fat and protein percentage as 3.22, 2.91; 2.46, 2.36 and 2.85, 2.52 in milk of Majaheim, Wadah and Hamra camels during mid-stage lactation. Konuspayeva *et al.* (2009) summarized 82 reports and stated the milk fat and protein in camel milk as  $3.82 \pm 1.08$  and  $3.35 \pm 0.62$ , respectively. Al-Haj and Al-Kanhal (2010) in their comprehensive review on dromedary camel from 1980-2009 reported mean values of fat and protein as 3.5% and 3.1%, respectively. Meiloud *et al.* (2011) reported fat and protein percentage as 2.92 and 2.50 in Mauritanian camel milk at various stages of lactation on natural grazing. Nagy *et al.* (2013) studied milk production of dromedary camels under intensive management in United Arab Emirates and reported average fat and protein concentrations as  $2.51 \pm 0.03$  and  $2.60 \pm 0.01\%$ , respectively.

Thus, the comparison with available data seems to show the high fat-protein values of Barela camel milk, especially regarding fat content.

Milk lactose percentage of Barela camel was found to be  $4.84 \pm 0.08$  in present study. Khan and Iqbal (2001) reported range for milk lactose percentage as 3-5.5% in Pakistani dromedary camels in different stage of lactation and parity in extensive and semi-intensive management systems. Faraz *et al.* (2018) reported very close percentage of lactose as 4.82 in milk of Marecha camel in Thal desert during early and mid-stage of lactation in 3-5 parity animals reared under extensive management system.

Current research findings are in agreement with Guliye (2000) who reported very close lactose percentage as 4.81 in Bedouin camels under extensive management system. Konuspayeva *et al.* (2009) reported lactose percentage in camel as  $4.46 \pm 1.03$  in 82 references from literature data. Al-Haj and Al-Kanhal (2010) in their comprehensive review on dromedary camel from 1980-2009 reported mean value of lactose as 4.4%. Reported mean value for percentage of lactose was to be  $4.91 \pm 0.61\%$  in Mauritanian camel's milk at various stages of lactation on natural grazing (Meiloud *et al.*, 2011). Nagy *et al.* (2013) studied milk production of dromedary camels under intensive management in United Arab Emirates and reported average lactose concentration as  $4.03 \pm 0.03$ . Milk lactose percentage was found to be 4.16% in Majaheem camels in Saudi Arabia which were raised on normal diet and of different stages of lactation (Elamin and Wilcox, 1992). Mehaia *et al.* (1995) reported 4.43% lactose in Majaheem, 4.46% in Hamra and 4.44% in Wadah camel's milk, respectively during mid-stage lactation in Saudi Arabia. Lactose percentage was found to be 4.6 in dehydrated camels as reported by Yagil and Etzion (1980).

Thus, contrary to fat and protein content, the variability in lactose content of camel milk in different conditions appears lower. Moreover, its change throughout

lactation is not so important than for fat and protein (Musaad *et al.*, 2013).

Regarding milk SNF (solids not fat) and total solid's percentage the values found were  $9.02 \pm 0.09$  and  $13.28 \pm 0.06$ , respectively (Table I) in Barela she camels in early and mid-stage lactation with 3-5 parity reared under extensive management system. These findings agree with the findings of Khan and Iqbal (2001) who reported range for SNF and total solids in camel's milk as 8.9-14.3% and 11.5-17.8%, respectively. Recently, Faraz *et al.* (2018) reported 8.96 and 13.38 percent SNF and total solids in milk of Marecha she-camel in desert Thal in early & mid-stage lactation with 3-5 parity animals. Mal *et al.* (2006, 2007) reported ranges for SNF and total solids percentages as 7.25-8.25 and 9.85-11.45, respectively in Indian camel's milk in different stage of lactation and parity numbers. Reported SNF and total solids percentages were found to be 9.18% and 14.68%, respectively in Indian Bactrian camel's milk (Mal and Pathak, 2010).

Elamin and Wilcox (1992) reported lower values with 7.8% SNF and 10.95% total solids in 81 milk samples of Majaheem camel fed with normal diet and at various stages of lactation in Saudi Arabia. Reported SNF and total solids percentages were 8.13% and 11.35% in Majaheem, 7.78% and 10.63% in Hamra and 7.61% and 10.07% in Wadah camel's milk, respectively during mid-stage lactation in Saudi Arabia (Mehaia *et al.*, 1995). Al-Haj and Al-Kanhal (2010) in their comprehensive review reported mean value of total solids as 11.9%. Al-Jumah *et al.* (2012) studied physico-chemical quality of camel milk and reported range for total solids and solids not fat as 7.76-12.13 and 5.56-8.29g / 100g. Meiloud *et al.* (2011) reported mean values for SNF and total solids as  $8.88 \pm 0.08$  and  $11.80 \pm 1.0$  in Mauritanian camel's milk at various stages of lactation on natural grazing. Nagy *et al.* (2013) studied milk production of dromedary camels under intensive management in United Arab Emirates and reported average total solids and solids-not-fat concentrations as  $9.98 \pm 0.03$  and  $7.56 \pm 0.03\%$ , respectively.

Thus, reflecting the richness in fat and protein and the relative richness also in lactose, Barela milk presents a relative high SNF and total solids compared to camel milk coming from other part of the world.

### Conclusion

The results of present study about the milk production potential of the Barela camel in Pakistan under its natural habitat proves that it could be a future food animal which could play a pivotal role in the food security and national economy of the country. However, it should be more fruitful, to achieve a clear monitoring of the milk production and composition throughout the lactation and even the career in a wide sample of lactating Barela camel to quantify the potential at national level.

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### Statement of conflict of interest

The authors declare no conflict of interest.

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