

## REGULAR ARTICLE

# Comparison of dairy performances between dromedaries, bactrian and crossbred camels in the conditions of South Kazakhstan

Moldir Nurseitova<sup>1</sup>, Gaukhar Konuspayeva<sup>1,2</sup> and Stefan Jurjanz<sup>3</sup>

<sup>1</sup>Department of Energy and Ecology, Al-Farabi Kazakh National University, 71 av. Al Farabi, 050073 Almaty, Kazakhstan

<sup>2</sup>Al-Kharj FAO Camel Project, Center for Agriculture Project P.O. Box n°761 Al-Kharj 11942, Saudi Arabia

<sup>3</sup>UR AFPA, INRA-Université de Lorraine, TSA 40602, 54518 Vandoeuvre cedex, France

## Abstract

The aims of the work compare similarly the yield and the composition. In this work determined the Camel milk composition (fat content, dry matter, density) and milk yield of Dromedaries, Bactrians and Hybrids in South-Kazakhstan condition in same farm, same time and repeated same animals. The milk sampled of 20 camel's milk, where 6 Bactrians (B), 5 dromedaries (D), 2 hybrids F1 *Iner* (I), 4 hybrids F1 *Nar* (N), and finally 3 hybrids F2 *Kospak* (K) with repeated 3 times (days). The milk of Bactrian camels contained significantly more DM and the same tendency was noted for the fat content. In the same time, the milk yield tended to be lower even if no signification threshold was reached. Contrarily, the milk of dromedaries was not so rich in absence of any significant difference to F1 and F2 hybrids except an increased density. F1 hybrids (*Nar-maya* and *Iner-maya*) had a slight but not significant tendency of increased milk yield but a more or less reduced contents and density. This difference seems to be extenuated for F2 (*Kospak*) animals. The effect of calving year was illustrated by significantly lower milk yields in the second year of lactation (3.8 versus 2.8 L/d,  $P < 0.05$ ), slightly increased contents of fat (4.9 versus 4.2 g/L,  $P < 0.10$ ) and Dry matter (14.0 and 13.8 g/L, NS) and also density (1030.0 versus 1032.3 g/L).

*Key words:* Milk yield, Composition, Camel species, Kazakhstan

## Introduction

The Republic of Kazakhstan is an original area of camel breeding as different populations of old-world camels cohabit on its territory. There are 186.6 thousands of heads camels (Agency of the Republic of Kazakhstan on Statistics, 2013). Indeed, there are double-humped (*Camelus bactrianus*) and one-humped (*Camelus dromedarius*) camels as well as hybrids at different levels of hybridization (Faye and Konuspayeva, 2012a). Depending on their geographical location Kazakh Bactrian camels were described in detail and proved in the form of genetic types:

- Uralo-Bukeyev type: most large animals, common in the north of the Caspian Sea (living in Atyraou, West Kazakhstan and Aktobe regions);

- Kyzylorda type: a smaller-sized animals, spread around the Aral Sea and along the course of the Syr Darya River (South part of Aktobe and Kyzylorda);

- Ontustik-Kazakhstan type (the South Kazakhstan): Kazakh Bactrian camels are small, but have all the productive characteristics of the breed, common in the South (South Kazakhstan, Zhambyl and Almaty region) (Terentyev, 1975).

The Bactrian camel is the species historically present in the colder part of Central Asia (Mongolia, NW-China and Kazakhstan) as these animals are better adapted to the strong winter by developing a thick woolen coat and their higher milk fat content to nourish the calf. Moreover, the more productive dromedary population which is widespread in the southern part of Asia and especially the Turkmen Arvana breed is present in the overlapping zone of both populations on the territory of Kazakhstan. Therefore, Kazakh camel breeder can hybridize these species to produce fertile offspring for dairy purposes (Skidmore et al., 2001) which would cohabit in the same herd (Faye and Konuspayeva, 2012b).

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\*Corresponding Author

Gaukhar Konuspayeva  
Al-Kharj FAO Camel Project, Center for Agriculture Project  
P.O. Box n°761 Al-Kharj 11942, Saudi Arabia

Email: konuspayevags@hotmail.fr

The dairy production by a herd composed by different species raised the question of the differences in milk yield and composition. Generally, Bactrian camels are known to be less productive. A comparison of milk composition between both species in different Kazakh herds (Faye et al., 2008) showed increased fat and protein content in milk of Bactrian camels in comparison to dromedaries and lower milk density in Bactrian compared to this density in hybrids. Nevertheless, the main product of Kazakh camel breeder is *shubat*, a fermented product based on the whole milk what make the breeder sensitive to improve especially the milk yield of their animals.

Therefore, the present work aims to compare similarly the yield and the composition in milk of both Old World species as well as hybrids in a Kazakh production system.

### Materials and Methods

The trial was carried out in the village Aigene (43°20' N, 79°58' E) in South Kazakhstan (Suzak region) situated on the borderline between steppe and the desert Moyumkum (Figure 1). This zone is characterized by few rainfall (<150 mm per year) and huge variations between summer (average of 28°C with some peaks over 40°C) and winter temperature (average of -17°C with some peaks under -30°C). According to Faye et al (2008), the following definition was used to identify the different genetic variants of camels: Bactrian and Dromedary are pure animals of the species *Camelus bactrianus* and *Camelus dromedarius* respectively. *Iner* is a F1 hybrid produced by a female dromedary and a Bactrian male, *Nar* is a F1 hybrid of Bactrian female and a dromedary male and finally F2 hybrids (*Kospak*). The herd of lactating females was composed of six Bactrians (B), five dromedaries (D), two hybrids F1 *Iner* (I), four hybrids F1 *Nar* (N), and finally three hybrids F2 *Kospak* (K). The herd went on pasture on steppe vegetation approximately 5-7 km around the village but came back for watering. The vegetation of this area was composed by low gramineae (*Bromus inermis*, *Zastazostis splendens*) and some shrubs (*Haloxylon ammodendron*, *Alhagi maurorum* or *camelthorn*, *Artemisia*, *Climacoptera lanata*, *Salsola arbuscula*). No supplementary feed was distributed to the animals.

Milking routine consists in milking shared between the calf and the farmer. The milk ejection was initiated by the presence of the calf. After the colostral phase, the calf emptied one teat and the three others were milked simultaneously by the farmer. The animals were milked 2 times daily. The

first milking time was at 6 am in the morning. Then the adults went to pasture in the steppe without the calf and came back around 11 am for drinking and a second milking time. Afterwards, they returned to the steppe with their calves but they stayed close to the farm due to the heat, then after 5 or 6 pm they went away again for grazing. Approximately at 9.30 pm, they came back to farm and were separated from calves and spent the night without the calves.

Milk yield and composition have been determined the 21<sup>st</sup>, 24<sup>th</sup> and 26<sup>th</sup> of June 2013, each time on the first morning milking. The yielded milk of the three milked teats were measured in a graduated measuring cup, the recorded yield was divided by 0,75 as one teat has been emptied by the calf and this morning milking has been multiplied by two in order to estimate the milk yield of 24h. The yielded milk was gently homogenized and a sample was taken in order to determine the contents of fat (FC), non fat dry matter (NFDm) and the density of milk (De) using a mid-infrared spectrophotometer equipment (Lactan 1-4 MINI<sup>®</sup>, Sibagropribor, Krasnoobsk, Russia). The total DM of milk was calculated by the sum of fat content and SNF and the fat yield corresponded to the multiplication of fat content and milk yield.

An analysis of variance was performed to compare all determined variables using the MIXED procedure of SAS<sup>®</sup> (version 9.3 2009, SAS Inst., Inc., Cary, NC) with the repeated time option. The model includes the fixed effects species (Bactrian, Dromedary, *Iner-maya*: F1 Dromedary female x Bactrian Male, *Nar-maya*: F1 Bactrian Female x Dromedary Male or F2-Kospak: *Iner-maya* female x Bactrian Male), parity (primiparous or multiparous), calving year (2012 or 2013), and the interaction between the species and the calving year. The experimental unit was the camel repeated at three sampling times. The covariance structure between the different sampling times was defined in the model as being auto-regressive after verification of Akaike and Schwarz-Bayesian criterions (Littell et al., 1996). Significance was declared at P < 0.05 using the error of the sum of square type III. The values of the analyzed variables were presented as least square means (i.e. adjusted for the effects of the other factors in the model) and were compared by Tukey t-test.

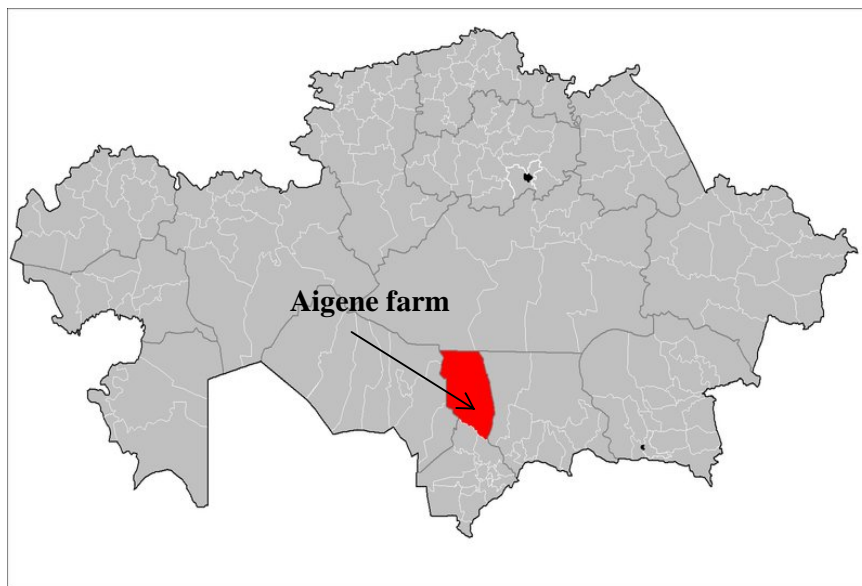


Figure 1. Localisation of Aigene farm.

Table 1. Effect of species, parity and calving year on milk yield and composition.

	Effects				Root MSE	Least Square Means				
	species	parity	Calv. yr	Interaction Sp x Cy		B	D	F1-N	F1-I	F2-K
n						6	5	4	2	3
Milk yield (L/d)	NS	<0.10	<0.05	NS	1.1	2.9	3.2	4.0	3.5	2.9
Fat content (g/L)	NS	NS	<0.10	NS	2.2	5.3 a	4.2 b	4.2b	4.7 ab	4.4 ab
Fat free DM (g/L)	<0.001	NS	<0.01	<0.10	0.9	9.8 a	9.6 ab	8.6 d	9.2 c	9.3 bc
DM content (g/L)	<0.05	NS	NS	NS	2.8	15.1 a	13.8 ab	12.8 b	13.9 ab	13.8 ab
Density (-1000 g/L)	<0.001	NS	<0.001	<0.05	0,9	32.5 a	32.5 a	28.9 c	30.5 b	31.3 ab

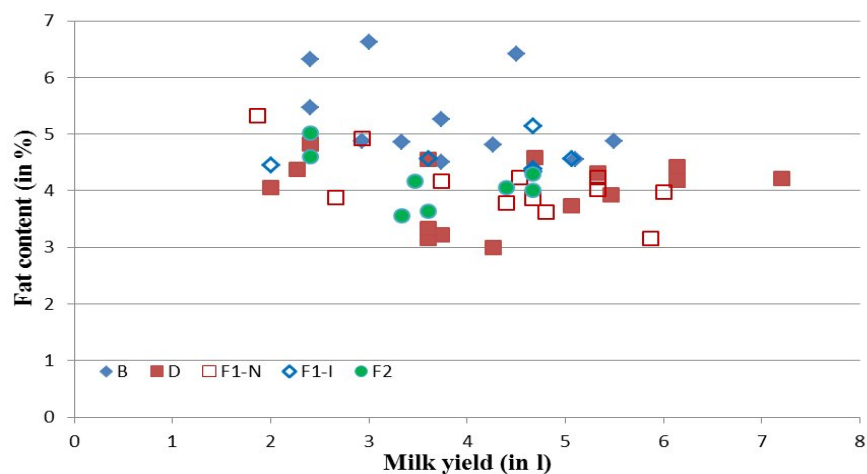


Figure 2. Fat content depending on milk yield and camel species.

## Results and Discussions

The species affected significantly the DM content (fat free and total) and the density of the milk. Indeed milk of Bactrian camels contained significantly more DM than this of dromedaries and the same tendency ( $P>0.1$ ) was noted for the fat content (Table 1). In the same time, the milk yield tended to be lower even if no significant threshold was reached. The observed values (fat, DM, density) in the context of Kazakhstan appeared higher than those reported in dromedary in Saudi Arabia (Musaad et al., 2013b) and the milk yield quite lower (Musaad et al., 2013a). Indeed, the milk of dromedaries was not so rich compared du Bactrian. Elsewhere, no significant difference was observed between dromedary and F1 or F2 hybrids except an increased density. F1 hybrids (*Nar-maya* and *Iner-maya*) had a slight but not significant tendency of increased milk yield but a more or less reduced contents and density in comparison to Bactrians. This difference seems to be attenuated for F2 (*Kospak*) animals.

The effect of calving year was illustrated by significantly lower milk yields in the second year of lactation (2.8 versus 3.8 L/d,  $P<0.05$ ), slightly increased contents of fat (4,9 versus 4,2 g/L,  $P<0.10$ ) and dry matter (14,0 and 13,8 g/L, NS) and also density (1030,0 versus 1032,3 g/L,  $P<0.01$ ).

Although the small number of animals would weaken the statistical power of our comparisons and the use of a conservative test to analyze multiple comparisons (t of Tukey), it seems that F1 hybrids would be more productive but with a lower milk yield. This effect tended to disappear in the F2 generation. The Figure 2 illustrated these relationships at the example of relationship between milk yield and fat content. Indeed, Bactrians did not reach so high milk yields but had the highest fat content in confirmation to the observations of Faye et al. (2008). Nevertheless, this work did not mention the milk yield of the studied animals. The concentration of milk in less productive animals has been reported in cows (Boland et al., 2013) or goats (Koop et al., 2010). This phenomenon has not only genetic reasons but mainly physiologic although selection ruminants in the Northern countries aimed to improve milk yield and to mitigate the decrease of contents. However, our results seem to confirm this phenomenon in lactating camels.

## Conclusions

This comparison of milk and composition between different camel species at the same time in the same herd showed no difference of milk yield

between Bactrians and dromedary but increased yield in F1 animals. The fat content in Bactrian camels is significantly higher than in all other species. Therefore Fat yield and DM content of Bactrians are not lower in our experimental conditions contrarily of what has been reported in the literature. Thus, Bactrian camels seem as productive in dairy performances as dromedary or F1 camels but better adapted to strong winter conditions in Kazakhstan. Contrarily, F2 animals have lowest dairy performances what would limit their interest for dairy purposes.

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