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Variability in body measurements of Bactrian Camels in South Kazakhstan

The aim of the present paper was to give a short description of the body measurements of double-humped camels in South-Kazakhstan, and to evaluate the changes of these body measurements along the lactation. In the frame of one experiment, four Bactrian camels were monitored and their body measurements regularly reported. The hump weight was estimated and the links with the body weight were assessed.

Keywords: Bactrian Camels, body measurements, hump storage.

М. Нұрсеитова, Б. Муратова, А. Орынбасарова, Т. Базарбаева, Г. Конуспаева, Бернард Фай

Оңтүстік Қазақстандағы бактриан түйелерінің дене өлшемдерінің өзгеруі

Жұмыстың негізгі мақсаты Оңтүстік Қазақстандағы екі өркешті түйенің дене пішімінің өзгерісі және лактация кезінде дене өлшемінің өзгерісін бағалау туралы қысқаша анықтама беру. Эксперимент барысында, екі өркешті төрт түйенің дене пішімі алынды. Өркеш және дене салмағы бағаланды.

Түйін сөздер: бактриандар, дене өлшемдері, өркеш.

М. Нурсеитова, Б. Муратова, А. Орынбасарова, Т. Базарбаева, Г. Конуспаева, Бернард Фай

Изменение промеров тела у двугорбых верблюдов Южного Казахстана

В данный статье рассмотрены измерения промеров тела двугорбых верблюдов в Южном Казахстане и дана оценка изменениям промеров тела в период лактации. Во время эксперимента у четырех двухгорбых верблюдов были взяты промеры тела. Оценивались вес горба и масса тела.

Ключевые слова: бактрианы, промеры тела, горб.

Introduction

Nowadays, camel rearing in Kazakhstan is a traditional sector of livestock economy and a significant source of meat, milk, *shubat* (fermented Camel milk) and wool in the desert and semi-desert areas of the Republic. The camel breeding in Kazakhstan is developed in west (Mangistau, Atyrau, Aktobe), west-south (Kyzylorda), south (South Kazakhstan, Zhambul) and south-east (Almaty) parts of Kazakhstan (Figure 1).

The camel population in Kazakhstan is composed of double-humped (*Camelus bactrianus*), one-humped (*Camelus dromedarius*) camels and their hybrids at different levels of hybridization [1].

A description of the different breeds is available [2], but the variability in the phenotypes was rarely described, except in local reports [1]. In consequence, the phenotypic description of Bactrian camel was rarely available in international literature. Recently data were published on Bactrian camel in India [3], but the results were limited to a list of body measurements without identification of the links with the different phenotypes described by the camel farmers.

Indeed, body measurement of camels could be used to determine the phenotypes [4] and to assess the breeding and economic value of animals [5]. Elsewhere, the body condition scoring [6] and the body measurements [7] helps to assess the quantity of energy stored in animal and approximately live weight of camels. In the frame of one experiment, four Bactrian camels were monitored and their body measurements regularly reported. Thus, the aim of the present paper was to give a short

description of the body measurements of these double-humped camels in South-Kazakhstan, and to evaluate the changes of these body measurements along the lactation.

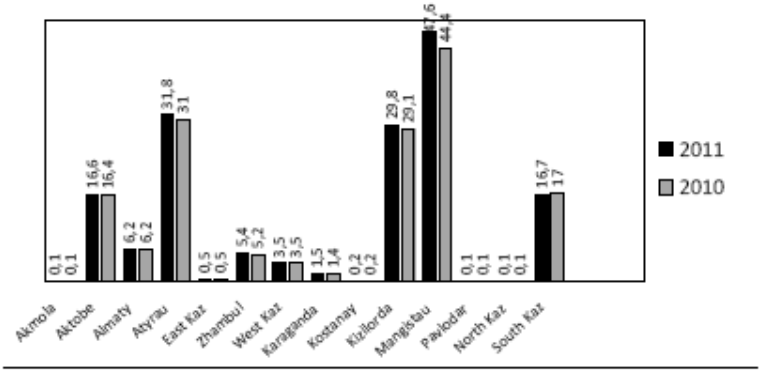

Figure 1 – Livestock of camels in the different oblasts of Kazakhstan, thousand goals (source: Agency of the Republic of Kazakhstan on statistics [12])

Materials and methods

1. Study area

The observation survey was achieved in South-Kazakhstan, Suzak region. This area 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 statistical department of Suzak region, there are nine thousand heads of Camel in 2013.

2. Animals

All experimental Camels were with other camels in the farm. Four lactating Bactrian camels were monitored. They were 7, 7, 15 and 16 years old (respectively 2, 2, 5 and 5th parity) and in healthy conditions all along the monitoring. They were lactating camels and because the seasonal reproduction with a concentration of calving during the cold months of the year, they were at comparable stage of lactation (2-3 months at the beginning of the monitoring).

3. The measurements

*a. **Body measurements***

The measurements were achieved on corridor standing animals with a meter-ribbon and reported in cm. On each camel, the following measurements were collected: neck circumference NC (1), body length BL (2), Heart girth HG (3), thigh circumference TC (4), the height of the humps (Front HH1 (5), back HH2 (8)), small (HD1) and large (HD2) diameters of the humps (front (6, 7), back (9, 10)) (Figure 1.).

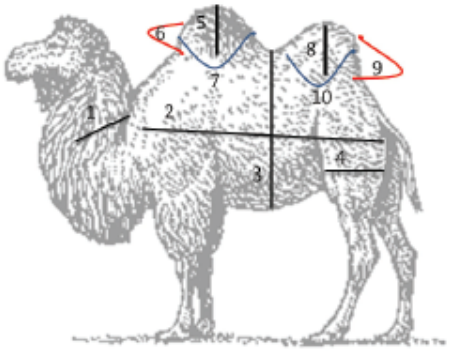

Figure 1 – Body measurements in Bactrian Camels

The measurements were achieved on the animal after taking off the wool which could modify the reading of the different distances. Regarding the hump measurements, the reported values (height of the hump HH), small diameter HD1 and large diameter HD2) were used to assess the volume and the weight of the hump.

The animals were weighed at the beginning of the experiment on a scale for trucks.

b. Hump measurements

The hump shape was approximately regarded as a cone with ovoid base and the volume could be assessed by the formula:

$$V=1/2\ (4/3\pi*rl*rL*rH)$$ (Figure 2)

Where rl=small circle radius of the cone's base (here HD1/2)
rL= large circle radius of the cone's base (here HD2/2)
rH= height of the cone (here HH).

In order to take in account the skin sickness, the values HD1 and HD2 were reduced by 4cm (2 x2cm) and the value HH by 2 cm.

The weight of the hump was estimated by considering the fat density which is 0.84 [8].

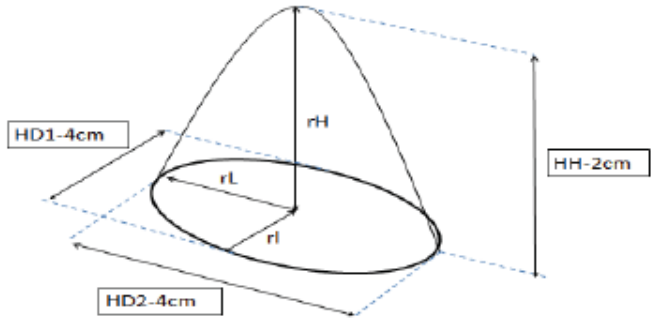

Figure 2 – Representation of the hump shape for assessing volume and weight

4. Statistical analyses

The different measurements were analyzed by using simple descriptive analyses (mean and standard deviation). The time effect was assessed by time series analysis. The correlations between parameters were tested with the Pearson coefficient. For estimating the weight from the body measurements, a stepwise linear regression was used by introducing the different measurements (NC, BL, HG and TC) in the linear model.

The software used was XLSTAT (Addinsoft ©).

Results and discussion

On average, the body length was 160 ± 8.3 cm, the heart girth 219 ± 8.1 cm, the thigh circumference 92 ± 4.0 cm and the neck circumference 85 ± 9.9 cm. These values were higher to those reported on Bactrian camel in India (Makdhoomi et al., 2013): 129.5+2.0 for body length, 210.8+2.9 for heart girth and 81.3+1.04 for neck circumference. Therefore, Kazakh Bactrian camels appeared to have higher size than those Indian breeds. The mean estimated hump weight was 7 ± 2.4 kg for the front hump and 10 ± 4.9 kg for the back hump.

Changes in body and hump measurements

The changes of the different dimensions along the lactation were not significant (figure 3), but a slight increase of the body length was observed and a transitory decrease of the heart girth at summer time. These changes were observed in all the camels. The animals being submitted to the same environment (feeding, practices, climate), the slight observed variations were due to the physiological stage and the resources availability. Indeed, the transitory decrease of heart girth in summer was concomitant of the hump weight decrease (figure 4). This period of the year is corresponding to the beginning of the hot season, to the decrease of the nutritive value of the natural resources, and the peak of lactation. In consequence, the camels must mobilize their fat storage [9], mainly accumulated in their humps but also partly under the skin above the ribs contributing to reduce the heart girth measurement [6].

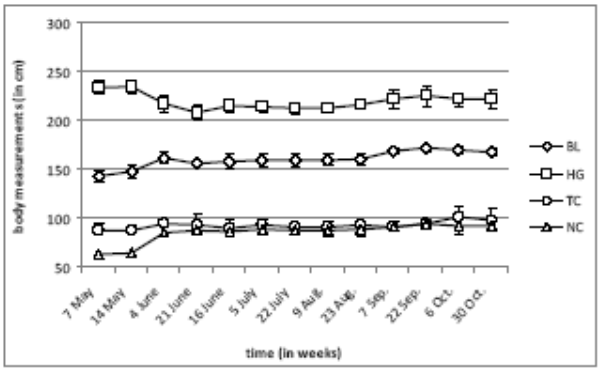

Figure 3 – Mean time changes of the different dimensions of the body (body length, Heart girth, Thigh circumference, neck circumference) of 4 Bactrian camels from May to October

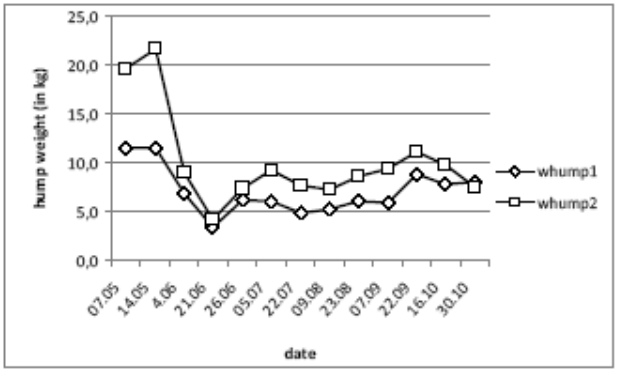

Figure 4 – Mean changes of hump weights (front-1 and back-2 hump) between May and October on 4 Bactrian camels

The Pearson correlation was significant between body length, thigh and neck circumference. At reverse the heart girth was independent of the other body measurements (table 1).

This result confirms the impact of fat mobilization on the only heart girth, the other body measurements being not linked to the change in body condition score, namely the body length, the thigh and neck circumferences. Those 3 parameters are linked to the size of the animals rather to its fattening status. Therefore, the hump weight was significantly correlated to the heart girth (table 1).

The negative correlation between hump weight and neck circumference, however is not clear. The hump weight was estimated to vary between 6 and 35 kg (sum of the two humps) which is corresponding to the mean value described in the literature in dromedary camel [10, 7]. On average, the back hump was heavier and represented 58% of the total humps weight. However, this value changed all along the trial varying from 49 and 65% with a slight tendency to decrease when the total fat stored in humps increased (figure 5).

Table 1 – Coefficient correlations between the different body measurements (significant correlations were in bold)

Variables	BL	HG	TC	NC	Humpw
BL	**1**	-0,171	**0,765**	**0,912**	-0,530
HG	-0,171	**1**	-0,024	-0,486	**0,759**
TC	**0,765**	-0,024	**1**	**0,686**	-0,386
NC	**0,912**	-0,486	**0,686**	**1**	**-0,813**
Humpw	-0,530	**0,759**	-0,386	**-0,813**	**1**

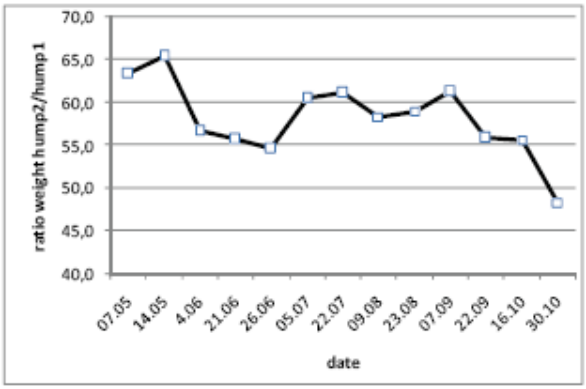

Figure 5 – Changes in the ratio weight of the back hump/weight of the front hump between May and October on 4 Bactrian camels

Prediction of the body weight

With only 4 animals, the prevision of the body weight is not easy to calculate. With the available data, the body length appeared the most correlated with the body weight (r=0.925; P=0.075), but due to the few numbers of animals, the statistical power is not sufficient to reach significant level. By using stepwise linear regression model, only body length could predict the weight with a good accuracy (table 2). The equation of prediction was:

Body weight = -838.6 +9.01 Body Length (SE= 0.265)

Table 2 – Body weight and prediction of the weight by the linear model

Observation	BW (kg)	Model (kg)
Camel1	400	423,9
Camel2	410	387,9
Camel3	530	514,1
Camel4	455	469,0

This model could be improved by measuring more animals. In the literature, many models are available on dromedary camels (Kamili et al., 2006), but less in Bactrian camels [1]. In the study of Kamili et al., 2006, involving 61 dromedary camels from Morocco, neck and thigh circumferences appeared better predictors of the carcass and of the live weight, contrary to our

results. The introduction of the hump weight in the model did not modify the results. In another study, Yagil [11] estimated the live weight by using the equation W=50*HSH*THG*HG, where W=live weight in kg, HSH=the shoulder height using the measuring stick vertically from the ground to the top of scapula, THG=the thoracic girth using the meter ribbon around the body just behind the sternal pad, and HG=the hump girth using the measuring tape along the abdomen over the midpoint of the hump.

Conclusion

The present results were limited to little number of animals contributing to a low statistical power. However, some trends could be put in evidence: the body length was better predictor of the live weight of Bactrian camel and the heart girth the best predictor for the body condition score which can be used as a tool for feeding management of the animals, accustomed to survive in harsh conditions.

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