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Research Article

Effect of Parity on milk yield and dam body change postpartum of Dromedary camel (*Camelus dromedarus*) under farming system in sudan

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ABSTRACT

The present study was carried out on healthy lactating she-camels (*Camelus dromedarus*) from Arabi Kenana breed in Khartoum, to record the potential milk yield in relationship to dam age and parity number, and change in dam body weight from birth to four month postpartum. Selected dams were taken immediately after calving and divided into two groups, (G1) dams of 1st or 2nd parity, and (G2) dams of 3rd, 4th or 5th parity after parturition. Manual milking of she camels was done four times a day for each group during winter season for 120 days. Milk yield in the first 6 weeks was significantly higher ($p<0.05$) in G1 compared to G2. In the 10th week milk production of G2 increased then fell down in the 12th week and regularly increased with advanced lactation in the 14th and 16th weeks, compared to the fixed production level of G1. Overall yield of G1 was (2.7±0.31 l/d) and of G2 was (2.4±1.38 l/d). Live body weight of dams was taken in 1st week, 8th week and 16th week postpartum. Overall loss in body weight of G1 and G2 was (3-3.2%). Young dams (P1) lose little of their body weight after two months of calving compared to adults (P2), while adults regained more weight in the 3rd and 4th month of lactation compared to young dams. Milk yield of P1 increased regularly in the 6th, 8th, 10th and 12th weeks compared to fluctuating production of P2 in the same period. Generally, milk yield of P1 was significantly higher ($P<0.01$) in the 12th, 14th and 16th weeks than the 2nd, 4th and 6th weeks postpartum, while, P2 produced high yield in week 8th to 16th compared to 2nd, 4th and 6th postpartum. The present study indicated that variation of milk yield was not found to be affected by parity and dam age, but was mostly affected by the stage of lactation. However, a great variation in camel milk production may be attributed to the methods employed to determine yield, high genetic variation between individuals, breed, feeding and management conditions, milking frequency and persistency of lactation, lactation number and stage of lactation. Dams restricted from suckling by calves lose less weight and produce more milk with advancing lactation compared to dams kept with their calves. High loss of body weight within 2-3 months after calving may be attributed to the ecological conditions and insufficient feed. Better management and sufficient feed in recommended to compensating for the loss against milk production.

Keywords: *Camelus dromedarus*, dam weight, milk yield, parity, restricted suckling.

INTRODUCTION

The dromedary camel plays significant roles in supporting livelihood of pastoral and agro-pastoral systems as well as a source of income generation and national economy in arid regions[1,2,3] where, the physiological adaptation and behavioral adjustment are the vital mechanisms for survival and

reproduction of camels[4,5]. Milk production by camels kept in Eastern Africa has been reported[6,7,8]. Average daily milk yield was observed to range between 1.9 and 2.5% of body weight, during different stages of lactation in camel[9], and it was stated that the mean daily milk yield of (18.68 L) from seven dromedaries constituted 3.26% of body weight[10]. The amount of milk which the calf drinks varies with its size, age and health, however, the amount of browsing material and water availability to the camel also determine the quantity suckled and the total quantity produced. Dromedary camel (*Camelus dromedarus*) is an important domestic animal in Sudan, as it is equipped to produce milk, meat and wool at comparatively low cost and at extremely harsh conditions[11,12,13,14,15,16,17,18]. The milking frequency largely depends on supply of and demands for milk, quantity of milk produced per animal, the number of milking animals, availability of other food for the herder's household, the sex, age and the health of calves. Moreover, in extensive systems of management, season exerts significant indirect effects on the quantity and quality of foodstuffs which, in turn, affect the milk production ability of the animals. Such information is needed to develop optimal breeding, development and marketing strategies for both meat and milk production programs. Therefore, the main objectives of this study are:

1) To evaluate the potential milk production capacity of the lactating dromedary she-camel in relationship to dam age, lactation number, milk yield and body weight change from birth to four month postpartum.
2) To assess body weight change of lactating she-camel from birth to 4th month postpartum.
3) To evaluate the interaction between dam body weight change and milk yield.

MATERIAL AND METHODS

Study area and animals:

The study was carried out in Al-Zakiat Camel Farm located in Bahri, at 15 km from Khartoum. The average of temperature during the experiment was 16°C (12 to 27°C). Ten healthy she-camels were selected from Arabi Kenana breed immediately after calving. The age of camels used in the experiment ranged from 6 to18 years, with mean live body weight of 477.13±32.29 kg. Similarity in body weight and breed were the criteria used to select dams.

Experimental design :

Selected dams were divided into two groups: Group one (G1) belonged to dam in first or second parity after parturition, and group two (G2) belonged to dam in third, fourth or fifth parity after parturition. A group of calves (FG) was freely suckling their dams, and another group (RG) was restricted from suckling to see the effect of this treatment of milk yield and dam body weight. Milk yield of young and adult she-camel was also recorded for sixteen weeks postpartum. Dams were kept together in one fence at the same environmental conditions under intensive system and same feeding and general management practices, supplemented with 2-2.5 kg/day of concentrated feed and a daily 3kg green alfalfa during the first two months. The concentrated feed was increased to 3.5-4 kg/day from the third month until the end of the experiment. Manual milking of she camels was done four times a day for each group during winter season for 120 days. Infected she-camel was separated and kept as alone from the herd.

Body weight measurement:

Measurement of live body weight of dams was taken in 1st week, 8th week and 16th week postpartum. Measurement of daily weight gain of camel was estimated according to formula given by[19,20]. The following equation was used for the body weight estimation:

$Y = SH\ (m) \times TG\ (m) \times HG\ (m) \times 50$

Where: Y = Body weight, SH (m) = Height of the shoulder in meter, TG (m) = The chest girth behind the chest pad in meter, HG (m) = The abdominal girth over the highest part of the hump in meter.

Statistical analysis:

Data was analyzed using the computer software (Statistics, version 8) and subjected to General Liner Model. ANOVA was run for milk yield and least significant differences test (LSD) was used to compare between means.

RESULTS

Experiment I: Restricted Suckling:

The change in body weight of dam during restricted sucking of calves is given in Table (1). No significant loss in body weight ($P>0.05$) was observed in dams of G1 and during the experimental period. Generally, less change was observed in live body of dam that restricted from suckling by calves compared to dam freely suckled by calves.

Table (2) and Figure (1) represent the milk yield of camel raised under semi-intensive system with free suckling (FC) and restricted calves (RC). FS gave almost same level of milk yield from the 2nd week up to 8th week, while the milk yield of RC decreased gradually and then increased in the 8th week. The milk yield in the first 6 weeks was significantly higher ($p<0.05$) in FS compared to RC. In the 10th week milk production of RC increased then fell down in the 12th week and regularly increased with advanced lactation in the 14th and 16th weeks,

compared to the almost fixed lower production level of FC. However, the overall milk yield was not significantly different between the two groups.

Experiment II: Parity Order:

Table (3) represents average live body weight of dam under intensive system at the beginning, middle and end of the experiment. Slight difference ($P<0.05$) of live body weight of dam was observed for P1 after one week of calving, as well as little loss during the first two months compared to P2. At the end of the experiment, P2 regained faster body weight with advanced lactation days compared to P1. Young dams lose little of their body weight after two months of calving compared to adults, while adults regained more weight in the third and fourth month of lactation compared to young dams.

Table (4) and Figure (2) show the results of milk yield of young and adult she-camel for sixteen weeks postpartum under intensive system. In the first month after calving, P1 produced same quantities of milk and with advanced lactation the yield was raised regularly in the 6th, 8th, 10th and 12th weeks compared to fluctuating production of P2 in the same period. Milk yield of P1was stable in last month of the experiment compared to P2.

Generally, milk yield of P1 was significantly higher ($P<0.01$) in the 12th, 14th and 16th weeks than the 2nd, 4th and 6th weeks postpartum (Figure 3), while, P2 produced high yield in the 16th, 14th, 12th, 10th and 8th compared to 2nd, 4th and 6th postpartum.

Table1.
Average percentage loss in body weight of dam under semi-intensive farming system during the experimental periods.

Treatment	1st week (B.W. kg)	8th week (% BW loss)	16th week (% BW loss)	Overall (% BW loss)
G1	407.33 a	3 a	2.93 a	3 A
G2	388.50 a	3.2 a	2.95 a	3.1 A

Letters on the same column bearing same superscripts are not significant ($P>0.05$). (G1) are dams in 1st or 2nd parity, (G2) dams in 3rd, 4th or 5th parity after parturition.

Table 2
Effect of restricted suckling (RC) and free suckling (FC) on milk yield of camel under semi-intensive farming system.

Treatment	Weeks								
	2nd	4th	6th	8th	10th	12th	14th	16th	Overall
FC (l/d)	2.8 Abc	2.7 abc	2.7 abc	2.7abc	2.8abc	2.83 Abc	2.4Abc	2.83 abc	7 ± 0.31 A
RC (l/d)	1.6 C	1.5 c	1.4 c	2.0bc	3.3ab	2.5 Abc	3.5A	3.5Ab	2.4 ± 1.38 A
Overall	2.23 ± 1.03 AB	2.08 ± 0.96 AB	2.03 ± 1.2 AB	2.3 ± 1.07 AB	3.1 ± 0.6 AB	2.7 ± 1.28 AB	2.9 ± 1.01 AB	3.2 ± 0.68 A	2.5 A

Letter on the same column bearing same superscripts not significantly ($P>0.05$)

Table 3
Average mean (%) of loss in dam body weight during the experimental periods under intensive farming system.

Treatment	1st week (BW kg)	8th week (% BW loss)	16th week (% BW loss)	Overall (% BW loss)
Gy	468.67 a	3.40 a	0.867 a	2.13 A
Ga	482.20 a	3.74 a	0.72 a	2.23 A
Overall	475.43 A	3.6 A	0.793 A	2.18 A

Letter on the same column bearing same superscripts not significantly ($P>0.05$)

Table 4
Effect of parity order on milk yield (L/d) of camel during experiment period under intensive farming system.

Treatment	Weeks								
	2nd	4th	6th	8th	10th	12th	14th	16th	Overall
Gy	3.5 E	4 de	5.5 Cd	5.7 bcd	6.7 abc	7.3 Ab	8 a	8 a	6.1±0.31 A
Ga	3.5 E	4 de	4.1 De	6.5 abc	7 abc	6.7 Abc	7.8 a	8 a	5.9±1.38 A
Overall	3.5±1.03 D	4±0.96 CD	4.8±1.2 C	6.12±1.1 B	6.87±0.6 AB	7.04±1.3 AB	7.9±1.01 A	8±0.68 A	2.5 A

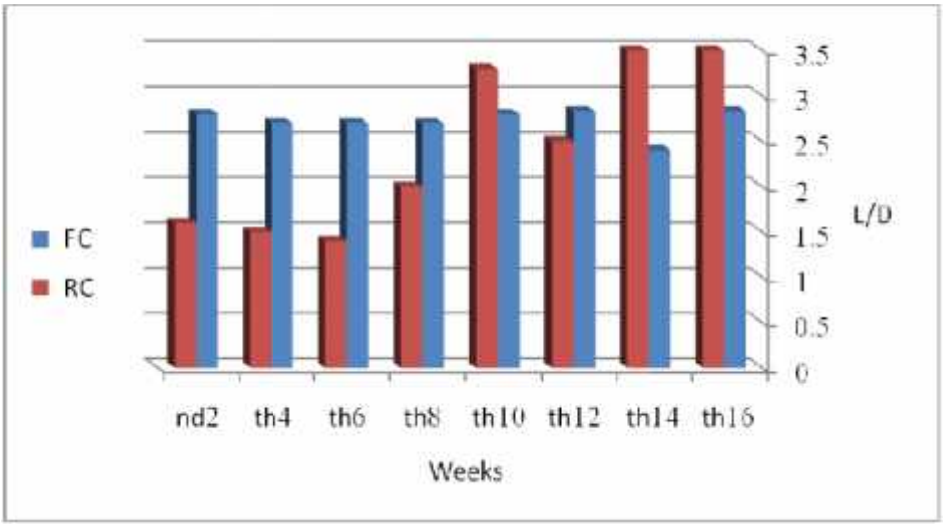

Figure 1
Milk yield of camels raised under semi-intensive system with free suckling (FC) and restricted calves (RC).

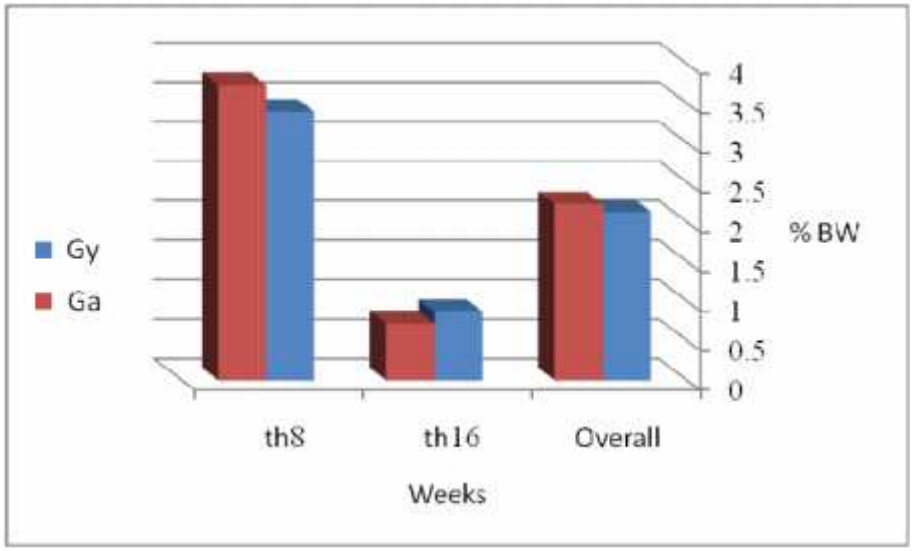

Figure 2
Percentage loss in dam body weight under intensive farming system.

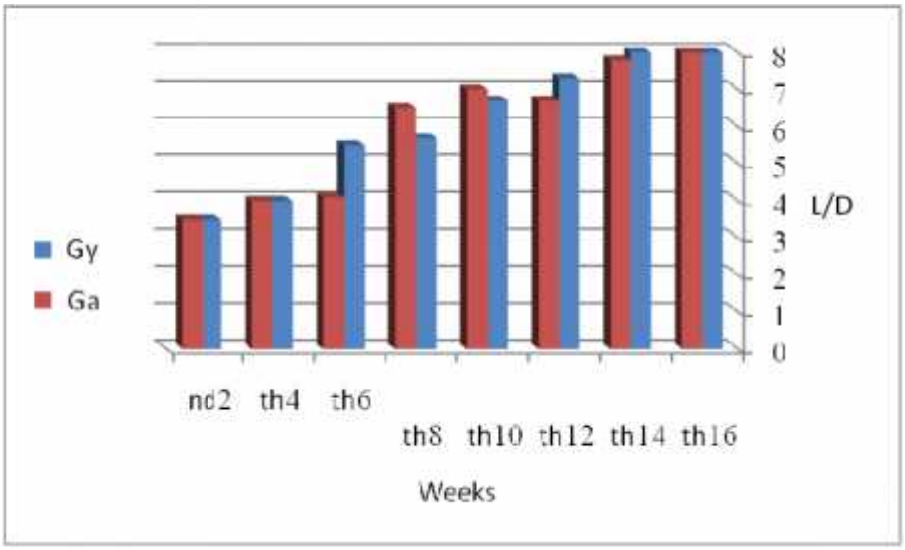

Figure 3
Effect of parity order on milk yield (L/d) of camel under intensive farming system.

DISCUSSION

The present study indicated that variation in change of body weight after calving and during lactation may be due to the level of stress, physiological situation and ecological condition of the she-camel. The average mean of weight loss in dams restricted from suckling by calves is lower than those freely suckled by calves during experimental period. This may be attributed to the process of milk production than adding stress for calves suckling. Therefore, more loss of body weight was observed from dam that stimulated to produce milk needed to cover both suckling of calves and demand of consumer. Moreover, little loss of body weight and fat breakdown of FG, which may be coincided to live body weight and amount of fat deposited in. No available data of previous study was conducted in this area. According to[21] the dams that lose calves before the age of 16 weeks had a lower body weight change than the dam of surviving calves in intensive system.

The results also revealed that milk yield of camel without calves is slightly increased with advancing lactation compared to that of camel kept with their calves. These findings disagreed with observations stated by[22] who demonstrated that milk production from camels without a calf was lower than from those with a calf and[23] stated that the competition between the calf and humans has an impact on the overall production of camel milk, but qualifying of milk productivity is difficult.

The change in body weight of dam during 4 months postpartum showed slight variation with age and parturition number. High loss of body weight within 2-3 months after calving may be attributed to the ecological conditions and insufficient feed to compensate the loss against milk production. The loss in body weight was closed to the findings of[21] who recorded more change in dam body weight in primiparous cows than in cows with three or more parturitions.

The variation of milk yield during 4 months after calving increased linearly with advance lactation period, in both young and older she-camels. The results was in line with the findings of [12] who observed the lactation peak at the 3rd month of lactation, with the mean value of 4.11 kg of milk for animals follow up without weighing the young camel before and after milking, and 6.90 kg when considering the portion consumed by the young camel. Provision of more concentrated feed was also found to play a great role in increasing milk production of the she-camel in the 3rd and 4th months of lactation. Our result was closed to the findings of[24] who observed improved productive traits with dietary supplementation. Variation of milk yield was not found to be affected by parity and dam age, but was mostly affected by the stage of lactation. This disagreed with[16] who reported positive correlated of milk yield with age of the she-camel under traditional pastoral system in Butana Region.

However, a great variation in camel milk production may be attributed to the methods employed to determine yield, high genetic variation between individuals, breed, feeding and management conditions, type of work, milking frequency, age of animal and persistency of lactation, lactation number and stage of lactation[23,25,26]. Milk yield of Saudi camels was found to be affected by parity and calving

year[27], whereas test day yield was influenced by parity, calving year, stage of lactation, and test milk day, and dam's parity influenced weights at birth and 3 months, and birth season affected birth weight, weight at 6 months and average daily gain 3-6 months.

CONCLUSION

Milk yields of camels used could probably be increased by both selection and crossbreeding with well known high milk producing breeds. There should be a continuous evaluation and description of the performance potential (milk and meat) of all the existing stocks of the country. Evaluation of the milk production potential should be extended to include post-weaning period to effectively evaluate milk production persistency, a character suitable for dairy production.

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