



Productive performance and behaviour of calf camel (*Camelus dromedarius*) under semi-intensive and traditional rearing system.

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ABSTRACT

A study was carried out on two different rearing systems for observation maternal behaviour during critical period (1st 20 days of life), productive performance and feeding behaviour during 3 months of age. Twenty lactating she-camels with their calves dromedary (*Camelus dromedaries*) Sudani camel divided into two groups Group one (n= 10 she-camel with their calves) managed in a semi intensive system in private farm in belbes city, all animals were herded during night in closed pen and set free during the midday. Supplementation consists of concentrates (2kg/day) and roughages (5kg/day) were used. Group two (n= 10 she-camel with their calves) managed in traditional system by pastoralist in met abo ali village, in sharkia province, Egypt. All the animals were brought to grazing areas where they selected the feed by themselves from the available plants without any supplemented feeding. The aim of the current study was to evaluate maternal, ingestive behaviour and estimate productive performance of the camel calves under traditional system and semi-intensive system and its influence on frequency of diarrhea, mortality, morbidity and incidence of mastitis. The results indicated that a significant increase in frequency of suckling, duration, calf camel 1st standing frequency drinking frequency, duration and grazing duration under semi-intensive system, while calf camel teat seeking frequency, duration and Calf camel 1st standing duration with significant decrease during 1st 20 days (critical period), While there was a significant decrease in grazing frequency in semi-intensive system. A significant increase in diarrhea frequency and incidence of mastitis under traditional system. The body weight and the daily growth rates of the calves under semi-intensive system were higher than the calves reared in the traditional system. It concluded that, the semi intensive production system showed some advantages for better rearing of calf camels compared with the traditional system. So, supplementing calves by good management under semi-intensive system lead to high productivity and reduction of animal losses.

Keywords: maternal behavior, Productive performance, calf camel, *Camelus dromedaries*, management system.

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1. INTRODUCTION

Camels are ruminant animals belong to family Camelidae, suborder Tylopoda which belong to the Order artiodactyla even-toed ungulates, genus *Camelus* and species *dromedaries* (Payne, 1990). *Camelus dromedaries* were the modern one-humped camel domesticated about 3000 BC in southern Arabia (Bennet et al., 1948) which varies from *Camelus bactrianus*, have the modern two-humped, and survived in the cold deserts and semi arid areas. The dromedary Camel (*Camelus dromedarius*) like any other herbivores animals grazing in arid range lands are seasonally challenged with shortage of feed and scarcity of water. However, they are known for their ability to survive and produce milk during dry and drought periods (Moaeenuddin et al., 2004; Wernery, 2006). Improvement of the reproductive and productive performance and reduction of animal

losses by management measures that are applicable to a mobile system appear to offer possibilities of increasing camel productivity of the herd in terms of milk production and growth of calves (Chimsa et al., 2013). The information on camel management system and its impact on productive and reproductive performance are inadequate. The management system of camel depends on factors including environment conditions, size and composition of the herd and the degree to which the owners are dependent on their herds, Gihad (1995). In traditional systems, the camel herders are in a continuous move in response to availability of grazing and water supplies. Camels may be raised alone or mixed with sheep and goats and sometimes cattle (Sweet, 1965). Rearing of Camel calves under traditional systems is faced with several challenges that result in high death rates of

the calves due to milk allowance to the calf is very critical, especially in the first three months of growth before the calf starts grazing. The major cause of calf mortality in camels is supposed to be malnutrition resulting from competition between calf and farmer for milk (Yesihak and Bekele, 2004). Most camels' owners now living towns and increasing productivity by useable system like semi intensive which the animals are depending on the natural pastures and when coming at evening they take supplementation diets like sorghum, cakes ...etc, also it improves the nutritional status of she camels in terms of improving body weight and growth rate of the calves lead to improve production and reproduction performance of the animals. The objective of this study was to minimize mortality and improving management system on calves' camel rearing in Egypt, also the present study was planned to compare the efficiency of body weight gains in camel calves raised under traditional system and semi intensive management in Egypt.

2. MATERIALS AND METHODS

2.1. Study area

The study was carried out in semi-intensive system in private farm in belbes city and traditional system by pastoralist in met abo ali village, in sharkia province, Egypt. The study was conducted between September and November 2015.

2.2. Experimental animals

Twenty camel calves dromedary (*Camelus dromedaries*) sudani camel (10 males and 10 females) at the first day of birth were selected and divided into two equal groups (group1 and group2), each was composed of ten calves (5 male and 5 female) with their dams. Group (I) was managed in a semi intensive system, in which the animals were kept in closed pen during the mid-day. Calves in addition of their suckling of their respective dams had supplementation diets (one kg of concentrate/head) at third months of age. Group (2) was under traditional system managed traditionally ad libitum watering, health care and parasites control practiced. In addition of suckling the camel calves were brought to grazing areas where they select food by themselves from the available plants (calves start nibbling almost at six weeks of age), no-supplementation was offered, watering regime every (6-7) days was applied. Calves are allowed to suckle two-quarters on the left side, while the other two-quarters are hand milked by women. Hand milking was applied; the milker usually approaches the she camels from the

left side. He stands on his right leg and balances the milking bowl on his left bent and uses all hands for milking. Milking was practical twice a day at approximately 12-hours interval; usually two teats were milked and leaving the remaining two teats for calf suckling. For suckling control Sorar technique was used, to prevent the calf from suckling, two teats are tied up with a soft tape of cloth removed only at milking time. Milking took place twice a day; it was done from 05.00 to 07.00 a.m in the morning and from 5.00 to 7.00 p.m at the evening, Camel calves were identified with different colour of plastic ear tag, sprayed against external parasites and dewormed against gastrointestinal parasites.

2.3. Behavioural observation

Calves camel behaviour were recorded in the time between 7 a.m. till 3 p.m. along experimental period by using focal sample technique Altmann (1974), for each group with intervals (12 minutes) by 2 hours daily, visually by using(a note book for recording behaviour, a stop watch, multipurpose counter and a video camera). The following behaviours were recorded:

2.3.1. Maternal behavior:

Included the frequency and duration of suckling, calf camel teat seaking and calf camel 1st standing.

2.3.2. Ingestive behaviour:

Included the frequency and duration of drinking behavior, rumination and grazing.

2.4. Productive performance

2.4.1. Live body weight

The restraining of the calves proved to be highly efficient without causing any stress on the animals while affording maximum security for the workers, Strong ropes made of cloths were used for calves' restraint. The live body weight of camel calves were obtained through direct weighing using a static weighing scale balances for birth weight and table balances for advance age (Chimsa et al., 2013). Weight of calves was measured using digital weighing scale from birth to 20 days of age then monthly till 3 month of age.

2.4.2. Daily body weight gain

Weight-suckle-weigh technique, calves were weighted before suckling and after emptying residual milk in the udder. The differences in weights were considered as daily weight gain.

2.5. Statistical analysis

Data were analyzed using PASW Statistics (SPSS version 18.0 for Windows) following examination for a normal distribution. Data obtained from this investigation were analyzed statistically using t-test Tamhane and Dunlop (2000).

3. RESULTS

3.1. Maternal behaviour during 1st 20 days of life

Concerning the effect of management system during 1st 20 days of life of calves camel on maternal behaviour as shown in (Table 1) showed that a significant increase in frequency of suckling, duration and Calf camel 1st standing frequency (4.25 ± 0.16), (10.17 ± 0.18) and (5.60 ± 0.14) respectively under semi-intensive system, While behavioral observations of calf camel teat seeking frequency, duration and Calf camel 1st standing duration with significant decrease (2.31 ± 0.14), (1.92 ± 0.13) and (2.03 ± 0.13) respectively under semi-intensive system.

3.2. Feeding behaviour during 3 months of life

Regarding the influence, the management system during 3 months of life on feeding behaviour of calves camel results in (Table 2) showed that a significant increase drinking frequency, duration and grazing duration under

semi-intensive system, while there were a significant decrease in grazing frequency in semi-intensive system.

3.3. Health status during 1st 20 days of life (critical period)

Illustrating the effect of the management system during 1st 20 days of life on health status in calves camel and its mother, results in (Table 3) showed that a significant increase diarrhea frequency and incidence of mastitis under traditional system.

3.4. Body weights during 3 months of age

In the present investigation, the results in (Table 4) indicated that the birth weight of calves raised under semi-intensive and traditional system showed non-significant different ($P > 0.05$). On the other hand, the live body weights of the camel showed significant effect ($P < 0.05$) through the age and within the type of management. Calves recorded higher weight in 20 days, 1, 2 and 3 months of age in semi intensive system than traditional system (Table 4).

3.5. Body weight gain during 3 months of age

In the present study, there was significant difference in body weight gains between the two management systems (Table 5), in semi-intensive system weight gain was significantly ($P < 0.05$) higher than the gain in traditional system which varying from 750 and 810 g/day.

Table (1): Behavioral observation (mean values \pm SE) in calves camel maternal behaviour during 1st 20 days of life under semi-intensive and traditional system.

Systems	Suckling frequency	Suckling duration	Calf camel teat seeking frequency	Calf camel teat seeking duration	Calf camel 1 st standing frequency	Calf camel 1 st standing duration
Semi-intensive	4.25 ± 0.16^a	10.17 ± 0.18^a	2.31 ± 0.14^b	1.92 ± 0.1^b	5.60 ± 0.14^a	2.03 ± 0.1^b
Traditional	1.70 ± 0.12^b	3.80 ± 0.23^b	6.68 ± 0.22^a	6.13 ± 0.17^a	1.95 ± 0.1^b	7.40 ± 0.20^a
P value	**	**	**	**	**	**

*^{ab}: Means in the same column bearing different superscripts are significant. SE standard error of mean; ** $p < 0.01$

Table (2): Behavioral observations (mean values \pm SE) in calves camel feeding behaviour during 3 months of life under semi-intensive and traditional system.

Systems	Drinking frequency	Drinking duration	ruminant frequency	ruminant duration	Grazing frequency	Grazing duration
Semi-intensive	3.84 ± 0.11^a	6.12 ± 0.12^a	1.70 ± 0.08^a	9.82 ± 0.17^a	1.45 ± 0.07^b	7.34 ± 0.19^a
Traditional	1.40 ± 0.08^b	2.19 ± 0.09^b	1.12 ± 0.05^b	3.62 ± 0.21^b	7.23 ± 0.14^a	2.31 ± 0.10^b
P value	**	**	**	**	**	**

*^{ab}: Means in the same column bearing different superscripts are significant. SE standard error of mean; ** $p < 0.01$

Table (3): Mean values \pm SE for health status in calves camel and its mother during 1st 20 days of life under semi-intensive and traditional system

Systems	Diarrhea frequency	Mortality frequency	incidence of mastitis
Semi-intensive	0.40 \pm 0.22 ^b	0.00 \pm 0.00 ^{N.S}	0.00 \pm 0.00 ^b
Traditional	2.20 \pm 0.48 ^a	0.20 \pm 0.13 ^{N.S}	1.00 \pm 0.53 ^a
<i>P</i> value	**	N.S	**

*ab: Means in the same column bearing different superscripts are significant. SE standard error of mean; NS not significant; ** p <0.01

Table (4): Mean values \pm SE for body weights in calves camel during 3 months of age under semi-intensive and traditional system

Systems	Average body weight of camel calves (kg \pm SE) at				
	birth	20 days (critical period)	1month	2months	3months
Semi-intensive	37.45 \pm 0.9 ^{N.S}	41.95 \pm 0.05 ^a	43.16 \pm 0.07 ^a	47.77 \pm 0.14 ^a	56.67 \pm 0.24 ^a
Traditional	37.60 \pm 0.03 ^{N.S}	40.89 \pm 0.04 ^b	41.39 \pm 0.05 ^b	45.18 \pm 0.11 ^b	52.52 \pm 0.20 ^b
<i>P</i> value	N.S	**	**	**	**

*ab: Means in the same column bearing different superscripts are significant. SE standard error of mean; NS not significant; ** p <0.01

Table (5): Mean values \pm SE for body weight gain in calves camel during 3 months of age under semi-intensive and traditional system

Systems	Average weight gain of camel calves (g \pm SE) during			
	Birth-20 days	20 days-1 month	1 month-2 months	2 months-3 months
Semi-intensive	750 \pm 0.00 ^a	750 \pm 0.00 ^a	770 \pm 0.01 ^a	810 \pm 0.01 ^a
Traditional	540 \pm 0.00 ^b	550 \pm 0.00 ^b	570 \pm 0.02 ^b	600 \pm 0.00 ^b
<i>P</i> value	**	**	**	**

*ab: Means in the same column bearing different superscripts are significant. SE standard error of mean; ** p <0.01

4. DISCUSSION

Increase in frequency of suckling, duration and Calf camel 1st standing frequency, while decrease in behavioral observations of calf camel teat seeking frequency, duration and Calf camel 1st standing duration under semi-intensive system. These results may be due to the majority of camel owners used calves to stimulate milk let-down and they milked she-camels twice a day. The milk let-down in the presence of the calf is the main method adopted by camel owners under traditional system. Pastoralist consumed the produced milk family consumption, while few of them sold the produced milk and took the little milk for calves under traditional system. Which the main source of camels feed was the pastures and the camels preferred to consume trees and grasses. calf camel

milking frequency and duration decreased under traditional system affected by presence of camel diseases, followed by lack of feed, lack of water, financial problems and lack of security This result agreed with (Osman et al., 2015; Ahmed et al., 2015). The semi intensive production system showed some advantages for better rearing of calf camels compared with the traditional system. Because camels are kept in open fences in which continuous water supply through pipe line and good feed quality including concentrate supplement are provided with increase milk let down (Sallam et al., 2012).

The increase in drinking frequency, duration and grazing duration, while the decrease in grazing frequency in semi-intensive system. These results may be due to camel grazing consumed different kinds of plants under traditional system which lead

to increase in frequency of grazing with utilize wider variety of local plants. (Chimsa et al., 2013) suggested that to know how much the requirement of the calves can be satisfied from the liquid milk suckled from the dams and solid feed available in the area in order to supplement the calves strategically.

Frequency of diarrhea and incidence of mastitis were increased under traditional system. These results may be due to mother camel raised under semi intensive system with higher milk production for calf camel, forage availability and supplementary diets, water availability and health care which all factors of management with a good effect on health status of mother and its calf. Also under traditional management with little or no diseases control especially mastitis which owner kept camel for subsistence rather than commercial purposes, which lead to little quality control because quantity rather than quality of she camel was important in traditional system. During 30 days of life under semi-intensive system the camel calf is raised mainly on the mother's milk, the mother always stays in nearby pastures and comes back to camp regularly for lactation. In this phase, the camel calf's mortality rate low and camel calf consumes its mother's first milk (colostrum) increase immunity and less susceptible for disease. Camel calf diarrhea was among the common diseases affecting suckling dromedary calves resulting in high mortality rate among this age group particularly in intensively kept camel herds (Saint-Martin et al., 1992; Schwartz and Dioli, 1992). Yagil (1994) mentioned that colostrum. It is highly possible that the high calf mortality usually reported could be attributed to this practice of denying the calves access to colostrum under traditional system. Mortality in camel populations was reported to be affected by age and the death rate was found to be higher in camels under six months of age (Khanna et al., 1992; Agab, 1993). Rearing of Camel calves under traditional pastoral production systems is faced with several challenges that result in retarded growth and high death rates of the calves, which the main cause of calf mortality in African camels is supposed to be malnutrition because of competition between calf and farmer for milk (Yesihak and Bekele, 2004). Although few reports are available in the literature, camel mastitis is not uncommon and is frequently seen in the field (Kapur et al., 1982; Obeid, 1983).

Increasing camel productivity and improving its productive performance by reduction of animal losses and efficient management measures. In the present investigation, indicated that the birth weight of calves raised under semi-intensive and

traditional system showed non-significant different. This may be due to the similarity of the management obtained to the pregnant dams, (Sallam, 2012). On the other hand, the live body weights of the camel showed increased through the age and within the type of management, this due to good management which included the nutritional status and health care of the calves in semi intensive system rather than traditional system. A positive correlation exists between maternal body size and age and the prenatal growth rate of the foetus. Also the supplemented diet for the dam may be increased milk yield according to the satisfaction requirements and due to that the calves got enough of the milk from their dams. Hammadi et al. (2001) reported that the birth weight of Camel Calves varied between 27 to 31 Kg, On the other hand the same authors mentioned that the average body weight between two groups was 55, 45 and 73 kg at 30, 60 and 90 post-partum days respectively. Growth of calves in 3-4 months was not significantly different from growth in 5-8 months but relatively higher than the growth in 9-10. The birth weight of Tunisian camel calves as 25.81 kg, lower than the average weights of the Indian dromedary as 37.23 kg similar that of Rendille and Gabbra calves in Kenya as 30.9 kg recorded by Field (1979). Such differences revealed the variations in camel calf performance attributable to breed, strain, environment, management and Heredity, directly via the genotype of the foetus and indirectly through the genotype of the dam.

Daily weight gain of calves was affected by months of lactation of calves, season of birth, parities of dams, sex of calves, genetic potential and mainly affected by nutrition and health status of the animals. Several studies conducted under various conditions have indicated that the potential of rapid growth rate during the early months of camel life (Degen et al., 1987; Ismail, 1991). In the present study, there was significant difference in body weight gains between the two management systems; this may be depending on the type of management and these findings were agreement with the results of Turki et al. (2007). Growth rate in dromedary calves has been reported extensively by many researchers (Bhargav et al., 1965; Knoss, 1977) they reported that the daily weight gain was at its highest at the third month with an average of 782 g. The results of the present study were in line of the findings of Al-mutairi (2000) in Saudi. On the other hand, these findings of the present study were disagreement with the findings of Hammadi et al. (2001) in Tunisia. Growth of calves in 3-4 months (300 g/day) was not significantly different from growth in 5-8 months but relatively higher

($P < 0.001$) than the growth in 9-10 (238 g/ day). The growth rate in 1-3 months of lactation in this study was higher than the report by Bissa (1998) which was 733g/day, respectively. Iqbal et al. (2000) studied the growth performance of camel calves kept under station and farmer's conditions, and found that the daily growth rates of camel calves at the station and farmer were 750 and 820 grams, respectively. Elsewhere the overall daily gain on sixth month was 760gram/day. Khanna et al. (2004) mentioned that the body weight gain varied from 702 and 789.21 gram/day from birth to 3 months of age.

In conclusion, the semi intensive production system showed some advantages for better rearing of calf camels (a significant increase in frequency of suckling, duration and calf camel 1st standing frequency) Also, productive performance such as body weight and growth rate of calves Camel compared with the traditional system. Therefore, rearing calf camels under semi intensive system improve the health status, lower mortality, decrease frequency of calf diarrhea and incidence of mastitis. It is recommended that, supplementing calves by good management under semi-intensive system lead to high productivity and reduction of animal losses in the first months of age which considered a critical period of calf camel. So, during 1st 3 months of calf camel life under traditional system should reared inside camp with addition supplementary ration for calf and its mother for increasing amount and composition of milk. Also, give a time of day for mother to suckling calf under traditional system in special partition with good ration and give calves colostrum under traditional system to avoid high percentage of mortality.

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