



Effect of Farming System on Camels Calving Interval in Western Sudan

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ABSTRACT

Eighteen (18) lactating she-camels and two mature male for mating were used to determine the effect of Management System on camel calving interval, The camels were maintained under semi-intensive (N = 9) and Traditional management system (N = 9) in North Kordofan State, western Sudan. The experimental females in each group kept together with the bull during 18 months. Blood samples were collected from jugular vein since 4-months post-partum and continue 14 successive months at monthly interval. The serum samples were separated and stored at -20°C and were analysed for progesterone concentration using progesterone specific radio immuno assay (RIA) kits. The results indicated that under semi-intensive system 77.8% of females had been pregnant in 5th - 8th month post-partum and the calving interval varying between 17 to 20 months. Under traditional system and during the experimental period 44.5% of females were pregnant in the 11th - 16th month and the calving interval varying between 23 to 28 months. The ratios of pregnant vs non-pregnant during experimental period in semi-intensive and traditional were 88.9% vs 11.1% and 44.5% vs 55.5%, respectively. Beside the behavioural signs progesterone level consider a good indicator for pregnancy in camels. In pregnant females Progesterone concentration increased significantly during early months. The range of Progesterone concentration varied between 1.10 - 5.76 ng/ml and 0.67 - 2.53 ng/ml in semi-intensive and traditional system, respectively. Our results allow quantifying this impact. With a supplemented diet including 2 Kg of concentrates and 5 kg of roughages per day, the fertility rate will be improved of 67%. It would be possible to expect more than two fold young camels in a year by supplemented 5 kg of concentrates. We conclude that under semi-intensive management dietary supplement during post-partum and early lactation period improves reproductive parameters for instance shortened calving interval.

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Introduction

Camel population in Sudan ranks the second in the world after Somalia with 4.5 millions heads (Faye et al; 2011). North Kordofan state only has the highest camel population with more than one million heads (Sahal, 2015). A farming system is strategies and interventions would be appropriate for developing livestock management which including activities and techniques used for increasing animals production and reproduction. In west Sudan, camels are traditionally reared under extensive system. However, the intensification of the production system is starting efficiently (Bakheit, 2008). Female of Sudanese's camels are normally sexually mature at 4 years of age, but mating is usually allowed when they are 5 years old and they may continue to breed until 25 years of age (Alhassan, 2015). Reproductive inefficiency is a major problem in many camel herds, where delayed first service, long calving interval, relatively short breeding season and poor conception rate are major contributors (Al Eknah, 2000; Kaufmann,

2005). Likewise, herd management, nutritional and pathological factors could be involved (Sghiri and Driancourt, 1999; Tibary and Anouassi, 2000). Many authors described the factors which effect on the camel reproductive performance: Musa (1979), Khanna (1990), Amin, et al (2007), Tibary et al (2005). authors demonstrated that biological limitations to reproductive efficiency in camels, late onset of puberty in both male and the female and long lactation anoestrous, age at first parturition and interval between parturition varies from 36 to 71 months and from 17.5 and 51 months, respectively; are probably the most commonly cited. Vyas et al (1999) mentioned that the reproductive performance of traditionally managed pastoral camel herds in Africa was low and this due to the late age at sexual maturity and first calving, the long post-partum anoestrus and calving intervals, and the factors that cause low fertility include poor nutrition, poor management practices, little or no disease control, limited breeding opportunities for females

due to the seasonality of breeding and limited rutting potential of signal stud bull used to service many females. Agarwal et al (1991) reported that the Progesterone hormone level in pregnant she-camel was decline during the 4th -7th month of gestation. Skidmore et al (1996) demonstrated that the progesterone levels during the first 90 to 100 days were relatively constant between 3.0 ng/ml and 5.0 ng/ml, and then decreased significantly to stabilizer for the rest of the pregnancy at 2.0 ng/ml to 4.0 ng/ml. The present study was therefore conducted to investigate the impact of farming system on camel calving interval and to improve camel reproductive performance.

Material and Methods

The Study Area

North Kordofan State lies between latitudes 11°:15' and 16°:30' N and longitudes 27° and 32° E at an altitude of 560 meters above sea level. Maximum temperatures range between 30 and 35°C, with peaks of above 40°C during the months of April, May and June, rainy season extends from July to October an August is greatest monthly rainfall. The study area can be categorized into two major soil groups, sandy and sandy-loamy soils. The dominant trees species in the study area are composed of Acacia species, grasses and herbs are dominated under story vegetation in the study area (Technoserve, 1987).

Experimental Animals Identification

Eighteen (18) she-camels were selected, from the Sudanese Arabi Kabaishi breed (the animals pointed at late pregnancy randomly from nomadic herd). Each of the experimental selected animal was identified by plastic numerical tag which. The mentioned she-camels acquired and divided into two equal groups, 9 she-camel of each, before parturition, group one (G1) managed in a semi intensive system in which all animals were herded during night in closed pen and set free during the midday gazing in natural pasture and allowing supplementation consist of concentrates (2kg/day) and roughages (5kg/day), *ad libitum* access to water, health care and parasites control were practiced after parturition. Experimental animals in group two (G2) served as a control managed traditionally but within the site of the experimental work, on traditional system the animals are brought to grazing areas where they selected the food by themselves from the available plants and allowing nothing as supplemented feeding, with the exception of offering salt as a brine or dry at wet season and watering regime every (6-7) days was applied.

Data Collection

Blood samples were collected through venipuncture form jugular vein which started at 4th month's postpartum and continues for 14 successive months at monthly interval. A total of 252 samples were taken during experimental period. The serum samples were separated and stored at -20°C and were analysed for Progesterone concentration using Progesterone specific radio immuno assay (RIA) kits supplied by Diagnostic Products Corporation, France. The determination of

Progesterone hormone concentration was happened in INRA laboratory in France. All experimental animals were mated naturally during their oestrous cycle depending to the bull detection and herdsmen observations. The early weaning for the calves didn't apply on this experiments just we notice the female behaviour in particular tail erect, constant urination, hind legs straddle out head raising as a detected signs when she-camels should be pregnant.

Determination of Progesterone Concentration

The Progesterone Hormone concentration was determined by the Plasmatic Extraction Method according to Saumande et al (1985) in INRA laboratory, France. The solution of immunological reagents, stored at 4°C with titrated Progesterone, device for evaporation under compressed air, centrifugal machine Beckman (J6B) was used in this method.

Statistical Analysis

The data were subjected to statistical analysis programme using SIGMA- STAT. Software computer Package described by Analysis of Variance (ANOVA) according to Snedecor and Cochran (1967). Duncan multiple range tests were used for means compression.

Results

Progesterone Concentrations

The progesterone concentrations attained a higher value (3.83 ± 0.08 ng/ml) in the semi-intensive system as compared with the traditional system (1.46 ± 0.82 ng/ml). The range of the progesterone hormone concentrations varied between 1.10 – 5.76 ng/ml and 0.67 – 2.53 ng/ml in semi-intensive and traditional system, respectively (Table 1 and Fig. 1). The level of the progesterone hormone in the semi-intensive system increased significantly ($P < 0.05$) on the 5th month postpartum till reach the peak on the 14th month postpartum after that decreased gradually during the remaining experimental period. The levels of Progesterone hormone in camels reared under semi-intensive system were showed non-significant difference on eight months postpartum, but the trend of the progesterone level showed significant increasing during the next month's till reach the peak and still constant during the 13th and 14th months postpartum before start to decrease gradually. On the contrast, the progesterone concentrations in the traditional system showed non-significant difference during 11th months postpartum, but there were obvious increasing start at the 12th month postpartum.

Camel Calving Interval

The results presented in ANOVA Table 2 showed that the type of system applied in camel management was effect highly significant ($P < 0.001$) in progesterone concentrations. On the other hand, the time per months after postpartum has affect significantly ($P < 0.01$) on the progesterone levels, Elsewhere, 77.8% of the experimental she-camel in the semi-intensive system

showed significant increase on the progesterone level in 8th month postpartum; in contrast only 33.3% of the total experimental animals under traditional system on the 13th month postpartum showed significant increasing on the progesterone level (Fig. 2 and 3). The results indicated that under semi-intensive system 77.8% of females had been pregnant in 5th - 8th month post-partum and the calving interval varying between 17 to 20 months. On the other hand under traditional system and during the experimental period 44.5% of females were pregnant in

the 11th - 16th month and the calving interval varying between 23 to 28 months. The ratios of pregnant vs. non-pregnant camels during experimental period in the semi-intensive and traditional were 88.9% vs 11.1% and 44.5% vs 55.5%, respectively. Beside the behavioural signs progesterone level consider a good indicator for pregnancy in camels. In pregnant females Progesterone concentrations increased significantly (P<0.05) during early months of pregnancy.

Table 1 Progesterone Hormone Level as affected by Management and Time of Post-Partum.

Months	System			
	Semi-intensive Average ng/ml	Average S.E. ±	Traditional Average ng/ml	Average S.E. ±
5	1.10 ^c	0.59	0.88 ^a	0.52
6	1.10 ^c	0.51	0.67 ^a	0.17
7	1.16 ^c	0.78	0.82 ^a	0.47
8	2.06 ^{bc}	1.35	0.73 ^a	0.25
9	3.48 ^{abc}	1.44	0.82 ^a	0.34
10	4.40 ^{ab}	2.12	0.72 ^a	0.35
11	4.36 ^{ab}	2.19	1.04 ^a	0.54
12	4.78 ^{ab}	2.58	1.52 ^a	1.09
13	5.74 ^a	3.00	1.88 ^a	1.56
14	5.76 ^a	2.99	2.18 ^a	1.70
15	5.04 ^{ab}	2.03	2.14 ^a	2.18
16	5.03 ^{ab}	2.07	2.13 ^a	2.09
17	4.85 ^{ab}	1.80	2.43 ^a	2.09
18	4.73 ^{ab}	1.61	2.53 ^a	2.25
N	126		126	
Av	3.83 ± 0.08		1.46 ± 0.82	

Av: Average mean (ng/ml)

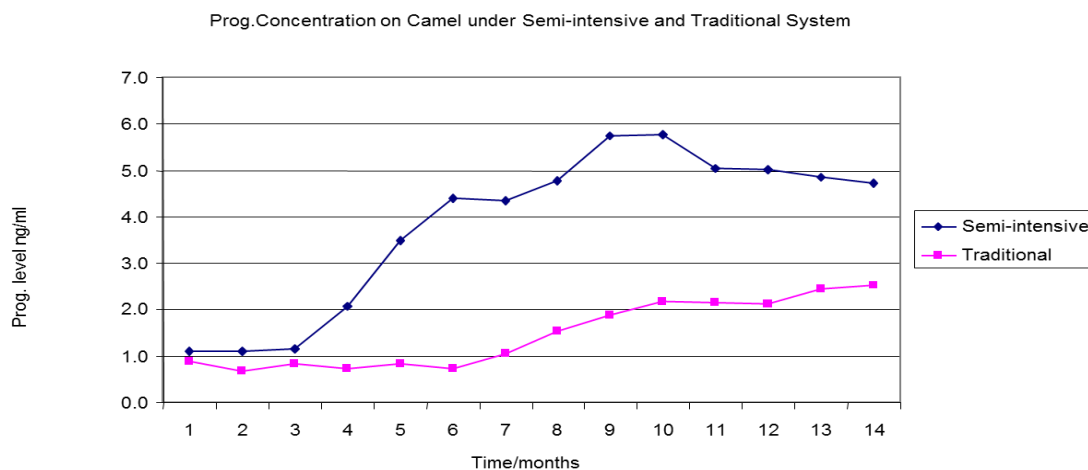


Fig. 1 The effect of farming system on camel Progesterone profile.

Table 2 ANOVA for Progesterone Hormone Concentration as affected by Management and Time of Post-Partum.

Source of Variation	SS	df	MS	F	P-value	F crit
System	352.0882	1	352.0882	124.1884***	3.10E-23	3.8833
Time/Months	314.7714	13	24.2132	8.5405**	5.06E-14	1.7641
Interaction	95.9969	13	7.3844	2.6046*	0.0022	1.7641
Error	635.0656	224	2.8351			
Total	1397.9222	251				

*** = P<0.001 ; ** = P<0.01; * = P<0.05

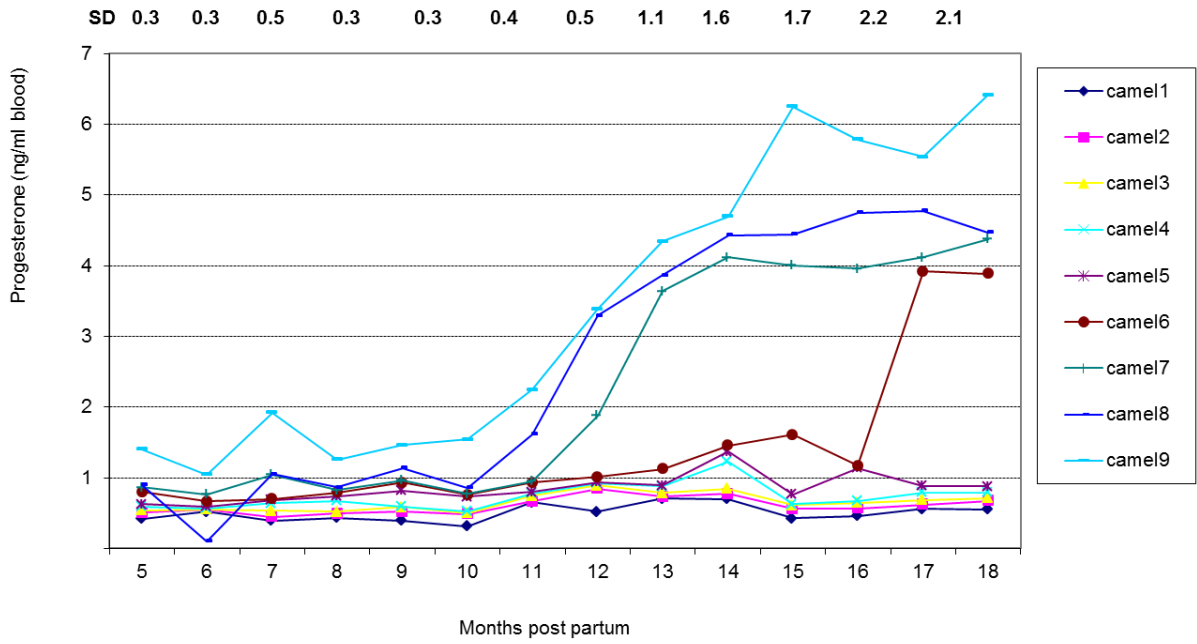


Figure 2 Progesterone concentration (ng/ml blood) on camel under semi- intensive management during the experimental period

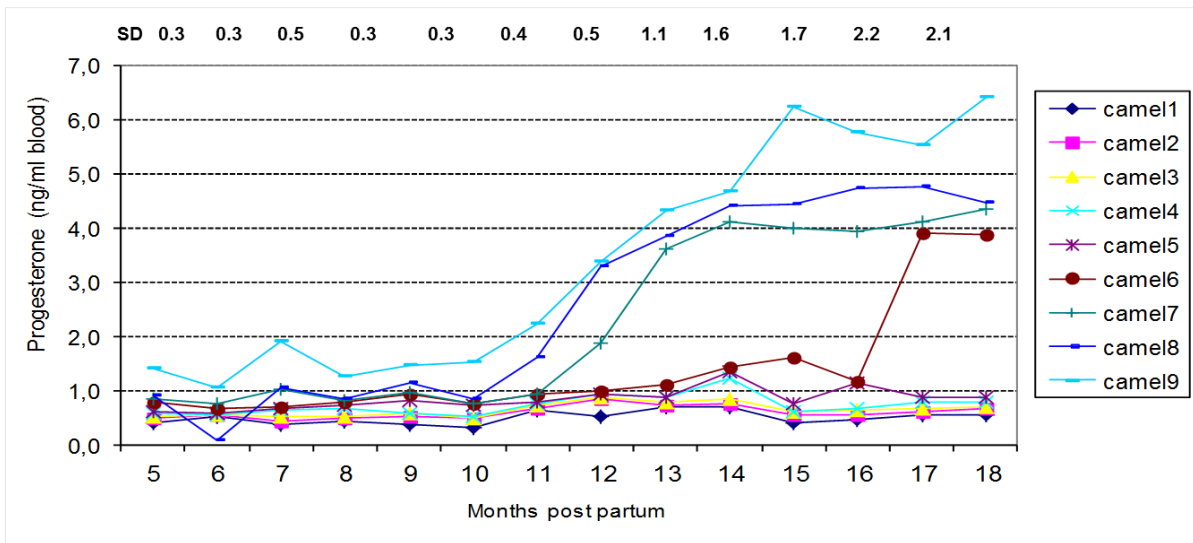


Figure 3 Progesterone concentration (ng/ml blood) on camel under traditional management during the Experimental period

Discussion

Findings of the present study were in agreement with Sumar (1988) who reported the Progesterone levels during pregnancy in all species of Camelids remains above 2 ng/ml from initial detection of the pregnancy. The results obtained from the camels under semi-intensive system which detected by sensory observation for pregnancy are showed that the Progesterone levels within the pregnant she-camel are varying between 2.2ng/ml and 7.6 ng/ml decline during the last 4 months before parturition, these results are in agreement with the findings of Agarwal et al (1991) who postulated that the

progesterone levels in the dromedary decrease gradually from 5 months of gestation until parturition. The mean of Progesterone concentrations was slightly higher during early pregnancy and fluctuated between 4.0 ng/ml and 5.5 ng/ml throughout gestation with the exception of a easygoing decrease between the ninth and tenth months of pregnancy. The Progesterone levels in camels under traditional system and non-pregnant females recorded values varying between 0.4 ng/ml and 1.8 ng/ml. These results are in line with the findings of Vyas et al (1999) who mentioned that the Progesterone levels in non-

pregnant female camels was ranged between 0.21 ng/ml and 0.58 ng/ml at 45 days after mating, elsewhere Progesterone levels on the pregnant female varying between 3.0 ng/ml and 9.85 ng/ml. Those results are in line with the findings of many authors (Agarwal and Khanna, 1990; Elias et al., 1984; Agarwal et al., 1987) who mentioned that the Progesterone profile in female camel during the first month after mating show a considerable individual variation and ranged from 3.0 ng/ml to 9.0 g/ml. That was in agreement with the results of Hegazy et al., (2004) who revealed that the Progesterone levels in non-pregnant female camels was between 0.0 and 4.7 ng/ml with a mean value of 1.1 ng/ml. The levels of the Progesterone in the pregnant camels on this study were on line with findings of Skidmore et al (1996); Karimi and Kimenyi (1993) who demonstrated that the Progesterone levels during the first 90 to 100 days were relatively constant between 3.0 ng/ml and 5.0 ng/ml, and then decreased significantly for the rest of the pregnancy at 2.0 ng/ml to 4.0 ng/ml. Findings of this study showed that the pregnant camels' percentages were 88.9% and 33.3% in semi-intensive and traditional system, respectively. The results of this study confirm findings the earlier reports in one-humped camel Skidmore et al., (1996) this kind of breeding management could reduce the calving interval in the camel. Further trials on a large numbers of animals are required to study the influence of nutrition, suckling and lactation as well as age and breed of camels on the onset of postpartum folliculogenesis. The farming system has a clear effect on the Progesterone hormone concentrations in camel. This may be attributed to pregnancy which happened in high percentage in camels reared in semi-intensive system. According to the observations signs like erect of she-camel tail and refuse of the male coupled with increasing of Progesterone levels more than 2 ng/ml which indicated that 77.8% of the camels reared under semi-intensive system had be pregnant on the 8th month postpartum, in contrast with the traditional system where only 33.3% of the total experimental animals were pregnant on the 13th months postpartum. The supplemented camels start to be pregnant at the 8th month postpartum that means the supplementation stimulated the ovarian activities. So, the calving interval on supplemented camels varied between 17 to 20 months, that was a shorter interval than in the non-supplemented camels under traditional system (calving interval = 25 to 30 months). The findings of this study showed that under semi-intensive management during post-partum and early lactation period camel's reproductive traits were improved. The ratios of pregnant vs. non-pregnant during total experimental period (18 months) in semi-intensive and traditional management were 8:1 and 4:5 respectively.

Conclusion

The study reflects clearly the significant contribution of improving farming systems on camel reproductive performance in which increasing pregnancy percentage to 67% and it would be possible to expect more than two

fold young camels in a year by supplemented 5 kg of concentrates. Progesterone hormone levels consider a good indicator for pregnancy beside the behavioural signs in camels. We conclude that under semi-intensive management, dietary supplement during post-partum and early lactation period improves reproductive parameters for instance shortened calving interval from 30 months to only 17 months. Further and deep investigations on camel calving interval under different farming conditions and controlled environmental factors to illuminate the potential of camel.

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