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COMPARATIVE GROWTH PERFORMANCE OF MARECHA CALVES (*CAMELUS DROMEDARIUS*) REARED UNDER SEMI-INTENSIVE AND EXTENSIVE MANAGEMENT SYSTEMS

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ABSTRACT

A 4 month study was undertaken on 12 Marecha calves. Six (3 ♂ and 3 ♀) were housed at CBRS reared under semi-intensive management system (SIMS) while other 6 (3 ♂ and 3 ♀) were owned by private farmers (extensive management system EMS). In SIMS, the calves were fed gram residues (GR) *adlib* after the browsing daily for 8 hr. while in EMS, calves were allowed browsing and fed households. Water was provided twice a day. Fortnightly weighing at farm was done by digital scale while in field weight was assessed by formula using body measurements. Mean overall weight gain in 120 days and DWG was different ($P<0.05$) which found to be 47.67+2.59 kg and 0.397+0.02 kg/d; 44.33+2.59 kg and 0.369+0.02 kg/d of male and female in SIMS while 64.67+2.59 kg and 0.539+0.02 kg/d; 52.33+2.59 kg and 0.436+0.02 kg/d of male and female in EMS. Mean DFI (kg/d) of GR on DM basis was found to be 3.34+0.23 and 3.29+0.23 of male and female in SIMS while 3.50+0.23 for male and female in EMS. In blood bio-chemicals Hb, cholesterol, triglycerides, TP, sugar, Ca and P were $P<0.05$ while urea, creatinine and albumin were non-significant ($P>0.05$). Significant differences for Ca, Cu, Zn, Fe and Mn were found in wool.

Key words: *Growth Performance, Marecha Calves, Semi-intensive, Extensive, Management Systems.*

INTRODUCTION

Growing needs and emerging awareness about the camel has changed the notion “ship of the desert” to “a food security animal” in many arid and semi-arid areas of the world. Pakistan is not exception to this – where camel is going to take a prime position that it can meet the milk and meat demands of the pastoral people. Camel is an indigenous genetic resource, it needs to be managed and preserved properly (Nagy *et al*., 2013). It plays an indispensible role in the pastoral ecology. Different studies highlight its unique characteristics especially under stress environment. To meet the rapidly growing demands of exploding population, the strategic idea is to minimize the dependence on external food supply. There is need to recognize the place of camel in farm animals and to get increased output from indigenous natural resources that have not been exploited yet (Pasha *et al*., 2013).

Several studies have indicated the potential of rapid growth rate in early life of camel calves under various conditions (Bakheit *et al.*, 2012). Most of the research on camel covers general, anatomical, veterinary and reproductive aspects whereas studies on management, production systems, nutrition and economics are very rare (Nagpal *et al.*, 2012). There is still relatively little known about the amounts of feed eaten by camels, especially under free-ranging conditions. Published results are conflicting but it does appear that intakes of feed per unit of body weight are low compared to other domestic species. This may be because of the larger body size of camels and lower energy requirements but it again emphasizes the advantages of keeping camels, since they need less feed to produce the same amount of body weight as other species (Raziq *et al*., 2008).

Most of the research work on camel is either based on one time surveys, short observations, interviews or estimates due to the reason that camel production is usually a migratory system as it is practiced mainly in remote areas with harsh living conditions, poor infrastructure and lower economic potential, thus making such studies difficult, expensive and time consuming (Raziq *et al*., 2010). Therefore, not a single long-term methodical study covering any aspect of productivity about Marecha camel under such conditions has been published. The Camel Breeding and Research Station Rakh Mahni is the only institute possessing the Marecha camels in the province Punjab. The current study was performed to compare the growth potential of Marecha calves under semi-intensive and extensive management systems. Some of the blood metabolites and hair mineral profile in growing calves were also studied along with the growth performance.

MATERIALS AND METHODS

Marecha camel calves maintained at Camel Breeding and Research Station (CBRS) Rakh Mahni, Tahsil Mankera, District Bhakkar and from the nearby field were used for this experiment to compare the efficiency of body weight gain in camel calves raised under semi-intensive management system (SIMS) and extensive management system (EMS). The climate of this area is arid to semi-arid subtropical continental and mean monthly highest temperature goes up to 45.6 ºC, while in winter it goes from 5.5 to 1.3 ºC. Mean annual rainfall in the region ranges from 150-350 mm, increasing from South to North (Rahim *et al*., 2011).

Marecha calves at CBRS were marked for identification by freeze branding while ear tagged in the field. All were dewormed to reduce the parasitic load. Calves were housed in semi-open pens throughout the trial at farm in SIMS while under available housing in EMS. Twelve Marecha calves (*Camelus dromedarius*) around 330+30 days of age (born during months of March to April 2013) with initial group weight as 1100+10 kg were used in 120 days trial with 15 days as adaptation period, to study their growth rate. Of these, six (3 male and 3 female) belonged to the Camel Breeding and Research Station (CBRS), Rakh Mahni, Tahsil Mankera, District Bhakkar reared under semi-intensive management system (SIMS) and the other six calves (3 male and 3 female) were owned by private farmers reared under extensive management system (EMS). Twice watering was provided in both the systems. In SIMS the calves were provided crop residues of gram (*Cicer arientinum*) after the grazing/browsing daily for 8 hours (8am-4pm) while in EMS calves were allowed grazing/browsing for 10-12 hours (as per prevailing practice) along with feeding of households (kitchen waste, house refusal and some grains). Initial body weight of the camel calves was recorded before shifting these calves to the respective treatment groups and thereafter all the experimental calves in semi-intensive management system were weighed fortnightly on digital weighing scale at farm before morning feeding while body weight of camel calves in extensive management system was assessed with the help of body measurements by using the formula as described by Kohler-Rollefson *et al*. (2001) in the field;

Live weight (kg) = SH × CG × HG × 50

Whereas;-SH: Shoulder Height, CG: Chest Girth, HG: Hump Girth (meters)

Average daily gain (ADG) was calculated by fortnightly recordings of body weight as current weight-previous weight/15. The feed intake of crop residues was calculated as the difference between the residual amount of feed and the amount offered. The average dry matter values of feed were measured and the dry matter intake (DMI) was then determined. The crop residues and herbage samples of the grazing/browsing material were analyzed for percent dry matter, crude protein, crude fiber, ether extract and ash (AOAC, 1990). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) was also determined (Van Soest *et al*., 1991). At the end of experiment, the blood samples were collected from all calves for hematological analysis by jugular puncture in two sets, one with EDTA as anticoagulant and the other without EDTA for serum separation. Hair samples were collected from shoulder, neck, hump and mid region of body of camel calves. The hair was cut with the stainless steel scissors into pieces of about 1 cm length from each region and mixed well to ensure homogeneity.

The blood samples were studied at CBRS Diagnostic Lab for hematological and biochemical analysis i.e. Hemoglobin (Hb) in blood sample while cholesterol, triglyceride, urea, total protein and albumin in serum samples were estimated by using standard kits (Spin-react, Spain) in hematology analyzer (BC 2300, Mindray Germany) and biochemistry Analyzer (DL 9000 Italy), respectively. Digestion of samples for mineral analysis was carried out at Animal Nutrition Lab, University of Agriculture Faisalabad. The 2 ml of plasma was mixed with equal volume of nitric acid in Kjeldhal digestion tube. The samples were kept overnight and then heated over digestion bench at below 90º C up to half. After that 5 ml of double acid mixture containing 3 parts of nitric acid and 1 part of 70% per-chloric acid were added to it and again digested, till white fumes emanated and the volume was reduced to 0.5 ml. The digested samples were cooled and diluted to 50 ml with distilled water (Bhakat *et al*., 2008). Ca and P concentrations were determined at HITECH Diagnostic Lab, University of Agriculture Faisalabad by using atomic absorption spectrophotometer (AOAC, 1990).

Hair samples were collected from shoulder, neck, hump and mid region of body of camel calves and transferred to Animal Nutrition Lab, University of Agriculture Faisalabad. The skirting of hair sample was done properly. Samples were washed with acetone and filtered, rinsed with plenty of water. These were dried in hot air oven at 100° C for some time and 0.5 g of dried mass was taken for further processing. Concentrated nitric acid (2 ml) was added to each hair sample and was kept at 100° C until half of the total volume evaporated. The samples were taken out and cooled. Concentrated per-chloric acid (2 ml) was added and again the sample was kept until half of the total volume evaporated. After this procedure, distilled water was added to give a total volume of 10 ml (Bhakat *et al*., 2009). The concentration of macro (Ca, Cu, Mg) and micro (Fe, Mn, Zn) minerals was determined at HITECH Diagnostic Lab, University of Agriculture Faisalabad by atomic absorption spectrophotometer (AOAC, 1990).

Statistical Analysis: Data collected on different parameters was analyzed statistically by using Fisher's analysis of variance technique having 2x2 factorial arrangements of treatments under CRD using GLM of SPSS software (SPSS, 2008). Tukey's test at 0.05 levels of significance was used to compare the differences among the treatment means (Steel *et al*, 1997).

RESULTS AND DISCUSSION

Growth Rate: On overall basis, male and female calves gained 47.67 and 44.33 kg weight in semi-intensive management system (SIMS) while 64.67 and 52.33 kg weight in extensive management system (EMS) during the experiment of 120 days, which was higher ($P<0.05$) in both males and females of EMS. The daily weight gain (growth rate) of male and female calves was 397 and 369 g/d in SIMS and 539 and 436 g/d, respectively in EMS during the study period that is also higher ($P<0.05$) in male and females of EMS (table-1). Higher growth rate was observed in male calves than female calves may be due to the reason that there are more androgen receptors present on muscle cells that respond to androgens more efficiently than estrogens (Hossner, 2005). The findings of present study are in line with findings of Iqbal *et al*. (2001) who studied the comparative growth performance of camel calves reared in field (extensive management system) with that of Barani Livestock Production and Research Institute (BLPRI) Kherimorat Attock calves (semi-intensive management system) and reported higher weight gain in farmer's calves than institute calves. In earliest studies in Pakistan, Knoess (1977) and Qureshi (1986) reported that average daily gain was 1.4 and 1.5 kg in male while 0.95 and 1 kg in female calves of heavy camel breed in field conditions, respectively.

A significant contribution of sex and year in Bikaneri camels has also reported by Baniwal and Chaudhary (1983). Sahani *et al*. (1998) reported average daily gain in 0-3 (0.63, 0.58); 3-6 (0.64, 0.62); 6-9 (0.37, 0.39); 9-12 (0.23, 0.23); 18-24 (0.16, 0.20); 24-30 (0.16, 0.17) and 30-36 months (0.18, 0.14) kg in Indian male and female calves, respectively under field conditions. While Khanna *et al*. (2004) reported average daily gain (ADG) as 0.7 and 0.77 kg in Jaisalmeri and Bikaneri Indian camel breeds from birth to 3 months of age, respectively under field conditions. Male calves weighed more than females. Moreover, Nagpal *et al*. (2005) reported daily weight gain as 377.6-420.9 g/d under traditional management system. In India, Saini *et al*. (2014) studied impact of feeding on growth performance of pre-pubescent camels under pastoral management in western Rajasthan and reported higher ADG in stall fed pre-pubescent camels than grazing group. Recently in Sudan Mohamedain *et al*. (2015) studied growth performance in dromedary camels under two feeding regimen and reported higher ADG as 800 g in zero browsing group having supplementation as compared to 350 g in free browsing group with no supplementation.

The findings of current study are in accordance with the findings of Bakheit *et al*. (2012) who studied the effect of management system on growth rate of calves in North Kordofan, Sudan and reported significant difference on growth rate at birth-6 months, 6-12 months and 12-18 months, respectively while overall daily growth rate was 534 and 316 g/d in semi-intensive and traditional management systems, respectively. Non-significant difference was found in male and female calves regarding their daily weight gain. But in present study higher growth rate was achieved in EMS.

Present findings are not in agreement with the results of Turki *et al*. (2007) and the findings of Khorchani *et al*. (2005) who study the camel calves' growth rate in Tunisia and revealed that the artificial nursing technique safeguards calves and ensures comparable mean daily gain compared to those of suckling calves (593 g and 607 g respectively). The results of the study under traditional system were not in line with the findings of Nagpal *et al*. (2005) who postulated that body weights of camel calves are varying between 241–276 Kg at age between 10 and 12 months and reported the daily gain is varying from 377.6 to 420.9 g/day.

Ouda *et al*. (1992) studied production performance of Somali and Rendille camels in northern Kenya and observed that regarding growth, sex and year affects significantly after two years of age. Reported weight gain in calves was 0.41 kg/d in males and 0.38 kg/d in females while weight gain after the sexual maturity was 0.12 kg/d in males and 0.06 kg/d in females under field conditions in northern Kenya (Musavaya, 2003). Furthermore, present findings are supported by Dabiri *et al*. (2003) who reported average daily weight gain as 0.7 kg in camels at 1-2 years old in traditional management system. In Kenya under proper nutrition reported average daily weight gain in camel calves was 0.87 and 0.57 kg from birth to 30 days and from birth to 180 days, respectively (Wilson, 1992) while in Egypt El-Badawi (1996) reported 0.83-0.97 kg daily weight gain from birth to 180 days in dromedary calves. Degen *et a1*. (1987) reported that the calves averaged 155 kg at 180 days with average daily gain of 0.68 kg. In Kenya the calves under traditional management system gains 222 g/d to 06 months age in dry season and 655 g/d in wet season (Field, 1979).

Feed Intake: The average daily intake (ADI) of crop residues was 3.34, 3.29 and 3.5 kg for male and female calves in SIMS and EMS (table-2), respectively. Non-significant difference ($P>0.05$) was found regarding intake of crop residues among two systems. These findings are not in agreement with the findings of Bhakat *et al*. (2008) who found crop residue intake as

significantly varied between two groups (5.53 vs. 4.37 kg/h/d in intensive management system (ISM) and semi-intensive management system (SISM), respectively. While DMI (kg/d) was lower in grazing pre-pubescent camels as compared to stall fed camels as reported by Saini *et al*. (2014).

Blood Biochemicals: The values of blood metabolites like hemoglobin, cholesterol, triglycerides, albumin, total protein, urea, creatinine, sugar, calcium and phosphorus in male and female calves of SIMS and EMS are given in table-3. The mean values for hemoglobin, cholesterol, triglycerides, total protein, sugar, calcium and phosphorus were found to be significant ($P<0.05$) for male and female camel calves in SIMS and EMS, respectively. Non-significant ($P>0.05$) values for urea, creatinine and albumin were found for male and female calves in SIMS and EMS, respectively.

Hemoglobin was found to be higher in males as compared to the females due to the reason that testosterone effects on the kidneys to produce more erythropoietin that accelerates the erythropoiesis (Murphy, 2014). Cholesterol and triglycerides were also found higher in calves of higher growth rate (EMS) as the calves were in active metabolic state. Urea and creatinine are the indirect tests for the proper kidney functioning and excretion (Osman and Al-Busadah, 2003). Being in active fattening condition the levels of total protein was also higher as the animals showed increased growth rate, moreover the serum electrolytes were also found to be higher in EMS as their ratio relates with the age factor being higher in early and growing age.

The current findings are in accordance with the findings of Indian scientist Bhakat *et al*. (2008) who determined blood biochemicals in camel calves under different management systems and reported significant differences for triglycerides and total protein as 34.79+3.67, 19.05+2.92 mg/dL and 6.28+0.26, 4.67+0.40 g/dL in camel calves in intensive and semi-intensive system of management, respectively while non-significant differences were found regarding urea and albumin in their study. Present findings regarding urea and sugar contents are not in line with the findings of Saini *et al*. (2014) who found significantly lower sugar and higher urea values in grazing pre-pubescent camels than stall fed group.

The findings of present study are different by the findings of Al-Busadah and Osman (2000) who determined hematological values in camels of Saudi Arabia and reported mean value for hemoglobin as 13.3+0.6, 12+0.2 and 10.1+0.8 g/dL in dry-adult, lactating and calves, respectively. Reported value for hemoglobin was 8.9-15 g/dL (Hassan *et al*., 1968); hemoglobin and albumin was 7.8-15.9 and 2.5-5.2 g/dL (McGrane and Kenyon, 1984); 11.4-14.2 and 3-4.4 g/dL (Higgins and Cock, 1984); 11.5 and 3.3 g/dL (Omer *et al*., 2006). Omer *et al*. (2008) studied hematological profile of Sudanese suckling camel calves to their lactating dams and reported significantly higher hemoglobin concentration in suckling calves as 11.42+1.20 to their lactating dams as 10.69+0.62 g/dL. Current findings agree with the findings of Farooq *et al*. (2011) who studied the normal reference hematological concentration of one-humped camels in Cholistan desert and reported the range for hemoglobin as 7-17 and 8-17 g/dL in male and females, respectively.

Osman and Al-Busadah (2003) studied normal concentrations of serum biochemical components and determined the values of glucose (134.4+11), cholesterol (58.4+8.6), triglycerides (31.4+3), urea (49.8+5.5), creatinine (1.5+0.1) mg/dL, total protein (7.1+0.3) and albumin (3.7+0.3) g/dL while Osman and Al-Busadah (2000) reported the value of albumin as 4.5 g/dL in Saudi she-camels. As present study values are of growing camel calves so lesser than these values. The current findings are supported by Sarwar *et al*. (1992) and Al-Busadah (2007) who determined blood values in Saudi camels and reported cholesterol as 1.91-4.2 mmol/L, creatinine as 0.16-0.53 mmol/L and calcium as 7.6-13.1 mg/dL.

Nagpal *et al*. (2012) determined serum profile of weaned Indian camel calves and reported glucose as 110.45+3.67, 105.54+0.80 mg/dL; total protein as 5.71+0.21, 5.10+0.15 g/dL; albumin as 3.74+0.06, 3.71+0.12 g/dL; urea as 20.08+1.14, 25.37+1.74 mg/dL; cholesteol as 35.75+3.41, 28.05+1.41 mg/dL; triglycerides as 28.27+1.32, 48.44+2.75 mg/dL; calcium as 10.94+0.26, 11.11+0.48 mg/dL and phosphorus as 8.66+0.41, 6.95+0.58 mg/dL in weaned calves at 6 and 9 months age, respectively.

Hair Mineral Status: The values of macro (Ca, Mg, Cu) and micro (Fe, Mn, Zn) minerals of male and female camel calves of SIMS and EMS are presented in table-4. The mean values were found to be significant ($P<0.05$) for calcium, copper, iron, manganese and zinc while non-significant ($P>0.05$) for magnesium in male and female calves under SIMS and EMS, respectively.

Indian scientists Bhakat *et al*. (2009) worked on mineral profile of camel calves reared under different management systems and reported calcium as (549.60+74.45, 434.40+60.21 and 719.72+78.62, 476.00+127.98), magnesium as (88.92+2.41, 67.60+6.33 and 77.48+3.67, 69.84+3.18), copper as (6.16+0.72, 4.30+0.44 and 7.36+0.66, 5.72+0.99), zinc as (66.04+4.38, 57.56+2.33 and 64.25+2.04, 54.76+1.46), iron as (285.72+26.55, 216.08+30.89 and 319.36+27.91, 261.92+33.37) and manganese as (21.56+3.65, 20.60+1.02 and 45.80+1.83, 32.92+4.36) mg/dL in calves reared under semi-intensive and intensive management system with guar phalgati (*Cyamopsis tetragonoloba*) and moth chara (*Phaseolus aconitifolius*) feeding, respectively.

Grazing/Browsing Species: Proximate analysis of grazing/browsing species like kikar (*Acacia nilotica*), phulai (*Acacia modesta*), beri (*Ziziphus mauritiana*), siras (*Albizia labbek*), jand (*Prosopis cineraria*), khagal (*Tamarix aphylla*), dhaman (*Cenchrus ciliaris*), persain (*Suaeda fruticosa*), khawi (*Cymbopogon schoenanthus*), bui (*Kochia indica*), bhakra (*Tribulus terrestris*), kari (*Capparis spinosa*), laana (*Haloxylon salincornicum*), phog (*Calligonam polygonoides*), karir (*Capparis decidua*), khar laana (*Haloxylon recurvum*) are presented in table-5.

Table 1. Overall weight gain (kg) and growth rate (kg/d) of male and female camel calves in SIMS and EMS.

Parameter	SIMS		EMS	
	Male	Female	Male	Female
Growth at 30 d	12.67+1.00 [b]	13.00+1.00 [b]	18.67+1.00 [a]	14.67+1.00 [b]
Growth at 60 d	12.67+0.82 [b]	11.67+0.82 [b]	16.67+0.82 [a]	14.00+0.82 [b]
Growth at 90 d	11.33+0.69 [b]	11.00+0.69 [b]	15.33+0.69 [a]	12.00+0.69 [b]
Growth at 120 d	11.00+0.62 [b]	8.67+0.62 [c]	14.00+0.62 [a]	11.67+0.62 [b]
Overall Weight Gain	47.67+2.59 [b]	44.33+2.59 [b]	64.67+2.59 [a]	52.33+2.59 [b]
Daily Weight Gain	0.397+0.02 [b]	0.369+0.02 [b]	0.539+0.02 [a]	0.436+0.02 [b]

Means having different superscript in columns are significantly different (P<0.05).

Table 2. Average male and female camel calves' intake of crop residues (kg) on DM basis in SIMS and EMS.

Parameter	SIMS		EMS	
	Male	Female	Male	Female
ADI at 30 d	3.13+0.22	3.12+0.22	3.33+0.22	3.27+0.22
ADI at 60 d	3.35+0.23	3.30+0.23	3.52+0.23	3.55+0.23
ADI at 90 d	3.53+0.24	3.48+0.24	3.77+0.24	3.80+0.24
ADI at 120 d	3.72+0.25	3.63+0.25	3.97+0.25	4.02+0.25
Daily feed intake/h	3.34+0.23	3.29+0.23	3.50+0.23	3.50+0.23

Table 3. Blood biochemicals of male and female camel calves in SIMS and EMS

Parameter	SIMS		EMS	
	Male	Female	Male	Female
Hemoglobin (g/dL)	14.73+0.26 [b]	14.47+0.26 [b]	16.13+0.26 [a]	15.97+0.26 [a]
Cholesterol (mg/dL)	35.97+1.18 [b]	34.30+1.18 [b]	45.63+1.18 [a]	44.67+1.181 [a]
Triglycerides (mg/dL)	20.33+1.85 [b]	19.00+1.85 [b]	33.33+1.85 [a]	28.67+1.85 [a]
Albumin (g/dL)	1.37+0.09	1.20+0.09	1.37+0.09	1.33+0.09
Total Protein (g/dL)	5.1+0.23 [b]	4.97+0.23 [b]	6.03+0.23 [a]	5.93+0.23 [a]
Urea (mg/dL)	33.00+3.20	28.33+3.20	34.00+3.20	32.67+3.20
Creatinine (mg/dL)	1.33+0.12	1.40+0.12	1.47+0.12	1.53+0.12
Sugar (mg/dL)	129.33+2.64 [ab]	134.33+2.64 [a]	125.33+2.64 [b]	128.67+2.64 [ab]
Calcium (mg/dL)	6.97+0.34 [ab]	5.97+0.34 [b]	7.14+0.34 [a]	6.54+0.34 [ab]

Means having different superscript in columns are significantly different (P<0.05)

Table 4. Hair mineral analyses (mg/dL) of male and female camel calves in SIMS and EMS

Parameter	SIMS		EMS	
	Male	Female	Male	Female
Calcium	513.50+11.83 [a]	473.27+11.83 [b]	529.77+11.83 [a]	498.68+11.83 [ab]
Magnesium	76.72+6.12	71.69+6.12	87.82+6.12	83.54+6.12
Copper	5.48+0.30 [a]	4.13+0.30 [b]	5.65+0.30 [a]	4.53+0.30 [b]
Iron	284.77+10.48 [a]	229.60+10.48 [b]	300.63+10.48 [a]	242.27+10.48 [b]
Manganeze	28.49+1.12 [b]	21.47+1.12 [c]	32.53+1.12 [a]	27.07+1.12 [b]
Zinc	50.63+2.61 [b]	40.83+2.61 [c]	59.33+2.61 [a]	46.89+2.61 [bc]

Means having different superscript in columns are significantly different (P<0.05)

Table 5. Proximate analysis (%) of crop residue and different grazing/browsing species

Feed/Forage Species	DM	CP	EE	CF	NDF	ADF	Crude Ash
Gram Straw (*Cicerarientinum*)	93.53	9.72	2.60	44.4	68.7	47.6	7.83
Phulai (*Acacia modesta*)	53.4	13.23	2.21	35.40	46.6	28.78	6.94
Beri leaves (*Ziziphusmauritiana*)	40.2	15.52	5.77	28.02	48.3	26.9	8.48
Siras (*Albizialabbek*)	37.3	16.17	6.58	27.25	43	29	16.33
Jand (*Prosopis cineraria*)	46.15	16.86	6.52	19.14	47.5	29	4.95
Khagal (*Tamarixaphylla*)	31.9	12.81	3.25	17.32	42.4	31.6	13.03
Dhaman (*Cenchrusciliaris*)	31.9	14.69	3.94	26.51	38.53	18.15	15.71
Persain (*Suaedafruticosa*)	30.3	10.57	5.52	33.14	48.7	27.6	7.54
Khawi(*Cymbopogonschoenanthus*)	34.6	9.53	2.01	35.67	62.1	43.5	7.14
Kali Bui (*Kochiaindica*)	33.78	10.80	4.91	27.61	58.6	39.76	13.32
Bhakra (*Tribulusterrestris*)	32.1	8.76	4.58	32.63	46.7	35.4	9.64
Kari (*Capparisspinosa*)	36.7	17.84	1.18	30.75	51.8	33.5	6.97
Laana (*Haloxylonsalincornicum*)	34.2	15.85	3.09	32.33	51.34	37.5	11.93
Phog (*Calligonampolygonoides*)	34.7	8.95	4.82	23.42	49.6	31.9	8.76
Karir (*Capparis decidua*)	49.4	16.75	1.52	24.64	53.6	37.8	14.76
KharLaana (*Haloxylonrecurvum*)	47.9	12.36	3.32	24.95	49.2	31.3	12.15

Conclusion: Higher daily growth rate was observed in camel calves of extensive management system and that may be due to the personal attention given by the farmers while the calves in SIMS have limited access to feed and less choice of selective vegetation. More than half kg daily gain was observed in EMS where calves were browsed maximum of the time and fed kitchen wastes and refusals but not routinely, so it is a clear fact of having great potential and it can be exploited if manifested by modern husbandry techniques like optimum feeding and management to overcome the protein deficiency prevailing in underdeveloped and overpopulated countries, like Pakistan. Here in this study EMS is better than SIMS. It is further suggested that extension work is badly needed to convince the camel herders to adopt changing management and feeding practices in camel husbandry at their desert adobes.

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