



## Estimating of some Productive Traits of Sudanese Arabi Camel (Darfur ecotype) Reared under Intensive Management System

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### Abstract

This study was conducted to evaluate the performance of some important productive traits of Darfur ecotype Arabic Camel (*Camelus dromedarius*) prevailing at Tumbool Camel Research Centre (TCRC), which situated western the Butana Area (east/central Sudan). Methodology applied was by using data taken from records of TCRC's herd (eight she-camels, two bull-Camels as herd founders and their viable progenies) during five years' course (2007-2011) managed under an inclining-to-moderate intensive closed system depending majorly on feeding sugar-cane byproducts (molasses & bagasse) and urea salt as concentrates, and agricultural residues as roughage allowances. The mean live body weight of the mature she-male is  $578.40 \pm 64.19$  kg. The birth weight of male and female camel calves estimates are:  $41.20 \pm 5.82$  and  $40.23 \pm 5.82$  kg, with sex ratio 0.59:0.41, respectively. The mean body weight gain of the male kids computed to the ages between one and twenty four months are successively  $1.25 \pm 0.37$  -  $0.49 \pm 0.02$  kg, and the equivalence for the female kids is:  $1.16 \pm 0.23$  -  $0.45 \pm 0.04$  kg. The mean daily ( $6.22 \pm 1.47$  Kg), monthly ( $186.78 \pm 46.55$  Kg) and lactation ( $1716.93 \pm 66.80$  Kg) milk yield showing concomitancy by parity. The mean lactation length is  $276.00 \pm 95.48$  days. The above results suggest that this ecotype is characterized as massive-weighted and moderate as milk yielder under the specified production system.

Keywords: Productive, Trait, Intensive system, Dromedary.

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### Introduction

Since that ancient times, camels has been quite an important creature to those natives inhabiting deserts, arid and semi-arid regions for their provision of milk, meat, in-cash income, glory, adornment, racing and transport. Recently, local civilians' cultures began a stormy interest of consuming camel products not only for nourishing, but also to their believe that they are remedies for some

diseases which are now under proof (Agrawal *et al.*, 2003; Cecile *et al.* 2007; Abdulaziz *et al.*, 2008). Camel excretes as urine also used as ethno medication to treat ascites, some abdominal diseases and as hair shampoo (O'haj *et al.*, 2002). These additional returns compelled to highlight more avenues upon the camels' merits to be added as valuable values to human kind. Numerous intrinsic & extrinsic constraints are facing Sudan

camels' performance, and consequently herd growth dynamics occurring under the pastoral management system. The majors were the climatic factors, long gestation, low reproductive efficiency in terms of delayed puberty and long calving interval (Eiwishy *et al.*, 1987; Babiker *et al.*, 2011) as functions of quality-feed and water scarcity at remote areas (Bacheit *et al.*, 2009). Research in production and reproduction characters over the different management systems is lacking to achieve data-base assist enhance exploring the maximum camel potentialities and planned future developing. Therefore, the objectives of the present study are to provide basic information for some important productive traits of Darfur ecotype under the closed intensive management system to investigate the impact of good nutrition and improved management system on camel performance.

### **Materials and Methods**

**Study location:** this study was carried out at Tumbol Camel Research Centre (TCRC), which situated western the Butana Area (east/central Sudan) about three kilometers north Tumbol rural town, 27 kilometers to the east from the Blue Nile river and 145 kilometers south Khartoum; at latitude 14° 55' N, longitude 33° 25' E & altitude 401.5 meters above sea level. The climate is mainly of poor Savannah Zone.

**Study animals:** the Centre founding herd nucleolus purchases was during 2006-2007 from Nyala sub natives (Western Sudan). Its beginning structure comprised eight females and two males of the Arabic Darfur-ecotype as mature breeders. During study, camel rearing was under an inclining-to-moderate intensive close production system, kept indoors metallic fencing with shelter. They distributed detached in accordance

to age-grouping structure, and maintained under fare nutritional conditions and close supervision. Since herd's footing to TCRC, a routine health programmed measures applied. Female camels normally introduced to the bull when detected on heat. Pregnancy determined post mating by re-introducing again to the bull to verify conception or returners. After parturition calves' birth weights were taken during the 1<sup>st</sup> 24 hrs using a digital balance (300.0 kg). The calves kept legging their mothers during the first four weeks for free access suckling. At one month-age they separated from their dams and allowed for suckling on two udder's quarters twice a day at milking time (5 am and pm), to be reduced gradually up to the weaning age (6-12 months). For stimulating hand milking calves' yearning was the routine. Adult & growing animals were monthly weighed using large animals bridge balance (1400 kg). The daily, monthly and total milk yield per she camel measured in kg (half rear & front nipples) and recorded along the lactation period which finished up usually by dam's mutiny due to pregnancy.

The concentrate ration was majorly formulated based on sugar cane by-products (molasses & bagasse) and urea salt (0.46 N) in maximal 2 %. Crushed sorghum grain, ground nut cake and wheat bran were adds on at low percent (5-15 %), in addition to lick mineral stone, normal salt (1.5 %) and bicarbonates (1-2%). The metabolizable energy (ME) and crude protein (CP) kept around 9.2 MJ and 11-13 % respectively on dry matter-bases. The meal was given twice a day warring of toxicity as, group feeding (lactating, pregnant, growers and mature bulls). These allowances were at the rate between 56-58 % from the total

daily feed intake. The important fodders were Abu-70 (*Sorghum bicolor*), Pioneer (*Sorghum bicolor x Sorghum sudanense* hybrid), Clitoria (*Clitoria ternate*) and Berseem (*Medicago sativa*).

**Statistical analysis:** the data were subjected to analysis of variance using Statistical Package for Social Sciences (SPSS, 10.5). Comparisons of means were done using Duncan multiple range test (1955) reformed by Kramer (1957).

**Results**

The live body weights from birth to two years-old are shown in Table 1. Sex ratio

was calculated to be 0.59 (male): 0.41(female). The overall mean birth weight estimate was 40.80±5.44 kg. The male calves (41.2±5.82 kg.) was found heavier than the female (40.23±5.82 kg.) but, significantly indifferent.

The male mean live mature body weight (758.16±60.42kg.) was found heavier opposite to the she-male (578.40±64.19 kg.) with highly significant difference. The ecotype overall mean scored up-to 625.44±63.13 kg (Table 2).

**Table 1: The mean body weight of calves from birth to two years old**

Body weight	Male* (kg.) (n=13)	Female* (kg.) (n=9)	Overall mean (kg.) (n=22)
At birth	41.20±05.82	40.23±05.82	40.80±05.44
1 <sup>st</sup> month	79.25±08.30	75.11±06.17	78.07±08.59
2 <sup>nd</sup> month	103.25±12.39	96.11±11.39	100.05±11.62
3 <sup>rd</sup> month	129.13±26.54	117.30±10.90	124.16±19.11
6 <sup>th</sup> month	181.43±29.50	163.11±17.45	171.12±24.50
9 <sup>th</sup> month	232.85±29.30	217.78±26.70	224.37±27.98
One year	280.00±50.30	266.25±35.30	272.14±41.17
1.5 years	333.00±41.32	319.17±33.53	325.45±36.01
2 years	396.67±47.26	366.66±35.12	381.66±40.70

\* Not significant

**Table 2: Mature Live Body Weight**

Sex	Replicates (n)	Range (kg.)	Mean (kg.)
Female (N=8)	158	479-780	578.40±64.19 <sup>a</sup>
Male (N=2)	56	630-850	758.16±60.42 <sup>b</sup>
Overall mean	214	479-850	625.44±63.13

Daily body weight gain (DBG) result is enumerated for the ecotype at concern in Table (3) following same arraying followed in birth weight. The result showed descending decrease by age without significant difference between the two sexes over the investigated age-classes (1 month to 2 years age). The

highest mean DBG for male, female and overall mean were 1.25±0.37, 1.16±0.23 and 1.21±0.31kg, successively, obtained from the 1<sup>st</sup> month age class, while that of the minimal (0.49±0.02, 0.45±0.04 and 0.47±0.06 kg.) were for the two years-age.

**Table 3: Daily body weight gain of camel's calves from one month to two years old**

Months	Male* (kg.) (n=13)	Female* (kg.) (n=9)	Overall mean (kg.) (n= 22)
1 <sup>st</sup> month	1.25±0.37	1.16±0.23	1.21±0.31
2 <sup>nd</sup> month	1.00±0.16	0.92±0.16	0.96±0.16
3 <sup>rd</sup> month	0.95±0.26	0.84±0.11	0.90±0.20
6 <sup>th</sup> month	0.77±0.17	0.68±0.07	0.71±0.14
9 <sup>th</sup> month	0.69±0.11	0.65±0.10	0.66±0.11
One year	0.66±0.14	0.62±0.10	0.63±0.12
1.5 years	0.53±0.02	0.51±0.03	0.52±0.07
2 years	0.49±0.02	0.45±0.04	0.47±0.06
1 <sup>st</sup> month to 2 years	0.79± 0.16	0.73±0.09	0.76±0.15
Average			

\* Not significant

The influence of parity on daily, monthly and whole lactation (corrected to 276 days) means milk yield (Table 4) was found insignificant between mean estimates for the 1<sup>st</sup>; 2<sup>nd</sup> and 3<sup>rd</sup> parities. A scrutinized look at Table 4 show clear observed few concomitant increases by parity. Delivers for the second time seize yielding earlier (165.20±44.26 d) than

those in first (341.00±164.60 d) and third (334.75±77.60 d) parities due to pregnancy after shorter service time post-partum, as behavioural stubborn. The overall mean daily, monthly and lactation milk yields were 6.22±1.47, 186.78±46.55 and 1716.93±66.80 kg for the successive parities in study.

**Table 4: Influence of parity on milk production and lactation period of the she-camel**

Parity Number	No. of animals (n)	Mean Lactation period (days)	Range (days)	* Mean Daily milk Yield <sup>1</sup> (kg)	* Mean Monthly Milk Yield <sup>1</sup> (kg)	* Corrected Mean Lactation Yield <sup>1</sup> (276 days)
1 <sup>st</sup>	4	341.00±164.6a	133-535	5.94±1.06	178.40±54.70	1639.44±48.76
2 <sup>nd</sup>	5	165.20±44.26b	123-228	6.31±1.90	189.40±24.70	1741.56±57.04
3 <sup>rd</sup>	4	334.75±77.60a	261-432	6.39±1.33	191.90±65.70	1763.64±97.06
Overall mean	13	276.00±95.48	123-535	6.22±1.47	186.78±46.55	1716.93±66.80

\* Not significant; <sup>1</sup> Half udder milk x 2

Like parity, season in this study had no significant effect on daily and monthly milk yields (Table 5). The autumn season score the highest mean daily

(6.57±1.7kg) and monthly (197.26±51.78kg) milk yields, while summer recorded the lowest (6.00±2.2 and 180.50±66.56 kg) successively.

**Table 5: The influence of season on milk production of she camel**

Season	* Daily Milk Yield <sup>1</sup> (kg)	* Monthly Milk Yield <sup>1</sup> (kg)	lactating dams per season (n)
Summer	6.00±2.2	180.50±66.56	12
Autumn	6.57±1.7	197.26±51.78	10
Winter	6.45±1.8	193.50±55.80	11

\* Not significant; <sup>1</sup> Half udder milk x 2

## Discussion

The calculated Sex ratio found disagreed with that (1.14:1) quoted by (Musa *et al.*, 2000). Findings on birth weight harmonized successively with the Saudi & Indian dromedary male ( $39.94 \pm 0.61$ ,  $38.63 \pm 0.97$  kg) and female ( $37.77 \pm 0.53$ ,  $38.249 \pm 0.93$  kg) calves bred under promoted management system (Al Mutairi, 2000 and Bissa and Kashi 2011). On the other hand, our result higher-ranking figures given for the Arabic Kabashi ecotype ( $39 \pm 31$ ,  $36 \pm 34$  kg. for males & Females, respectively) prevailing Kurdofan region whereas the sex parameter reported significant (Bacheit *et al.*, 2009). Least values ( $31 \pm 4$  kg for male &  $23 \pm 2.0$  kg for female) were given by Hammadi *et al.* (2001), with high significant difference. However, our findings accordingly in birth weight were higher over the reviewed dromedary discussion and the insignificance appears to be inseparable of nutritional plane and good management added to the genotype characteristic. The other body weights found for growers in study were also superior when comparisons were committed over the targeted weights of homologues: 6<sup>th</sup>, 12<sup>th</sup> and 18<sup>th</sup> month age classes in literature. The above Kabashi recorded (Bacheit *et al.*, 2009) rather lower means for age-classes 6<sup>th</sup> and 12<sup>th</sup> but, equals 18<sup>th</sup> month age-class ( $123 \pm 2.21$ ;  $221 \pm 2.17$ ;  $326 \pm 2.4$  kg. successively). Other lower means ( $168.01 \pm 5.00$ ;  $263.55 \pm 7.03$  kg.) were reported for the 6<sup>th</sup> and 12<sup>th</sup> month age-classes on some Indian breeds (Bikaneri, Kachchhi, Mewari) reared under station conditions (Bissa and Kashi 2011), and also on the Black (Majaheem) one-humped camel (around 150 to between 291 and 315.3 kg for fattened 14 months-aged) as well (Bakkar *et al.*,

2000). The mature body weight of the ecotype in discussion was found higher than that reported by (Ishag *et al.*, 2009) for the Shanbali Arabic ecotype (Kurdofan) as the highest ( $516.69 \pm 12.48$  kg.) over the Kinani, Maalya, Maganeen, Annafi, Rashaidi and Bushari Sudanese ecotypes (Upper Blue Nile, Kurdofan, Butana Area and East Sudan regions). World wise, the result on female mean found was lower than Nagpal *et al.*, (2011) findings for the Jaisalmeri lactating camels ( $607.90 \pm 24.63$ ) but, higher compared to the Tunisian Maghrebi she-male ( $359 \pm 22$  to  $362 \pm 32$  kg) under traditional (Hammadi *et al.*, 2001) and range ( $378 \pm 25$  to  $436 \pm 36$  Kg.) conditions. On the other hand, male body weight falls within the range ( $532$ - $871$  kg) and mean given by Sajjan Singh *et al.*, (2011). The daily body gain (DBG) findings which supported by Al Mutairi (2000) on the ascending decrease trend, were generally higher than that of Bacheit *et al.*, (2009) for the Kabashi except a slight increase ( $535 \pm 9.83$  gm.) observed in the 18<sup>th</sup> month-age class alike to the increase on live body weight for same class. But, the author's findings unlike ours followed an ascending order by tending concomitant increase in 6<sup>th</sup> ( $477 \pm 10.94$ ), 6<sup>th</sup> to 12<sup>th</sup> ( $542 \pm 8.25$ ) and 12<sup>th</sup> to 18<sup>th</sup> month ( $585 \pm 8.37$ ) age classes. Bakkar *et al.*, (2000) reported higher average daily gain means (932, 803 and 767 g per day) for fattened Majaheem calves reported between 6<sup>th</sup> month age up to 14<sup>th</sup> month and agreeing Iqbal (2001) *et al.*, under farm conditions (0.75 and 0.82 kg.). In the contrary very low reveals (63.1 g) was recorded in camels of 1-2 years old and found significant in accordance to season (Zelege and Bekele, 2000). This higher scoring of Darfur ecotype in the different discussed

weights and DBGs can be attributed to the type genetic endurance and its interaction with the fare management systemization. That should at time, classify it as one of the world's massive sized dromedary. The overall mean daily milk yield found alike to Mehta, *et al.* (2011) on half udder findings (2887.12±16.08 and 3053.34±11.13 ml) estimated out of three cared Indian breeds (Bikaneri; Kachchhi; Mewari). Their findings are also insignificant between parities and following same trend of ours concerning concomitancy (2715.30±57.29 to 2809.17±11.08; 2993.42±15.81 to 3005.61±18.91; 3026.86±67.10 to 3484.85±44.36 ml). Higher (11.66±0.90 kg during 180 days for Pakistani Desi; 7.40 to 8.54 kg Indian Jaisalmeri; 7.6 kg Ethiopian) and lower (5.33±1.73 kg for Tunisian Maghrebi; 5.2-9.3 kg. Emirates dromedary) means for these ecotypes are successively reported (Iqbal *et al.*, 2009; Nagpal *et al.*, 2011; Hammadi *et al.*, 2009; Nagy and Juhasz, 2009; Megersa *et al.*, 2008). However, Kabashi under traditional system revealed low performance in daily and monthly yields (1.77 & 53.12 for primiparous; 2.32 & 69.64 for 2<sup>nd</sup> calvers; 2.53 & 75.81 kg for 3<sup>rd</sup> delivers) with significant difference only between primiparous and the two rest parities (Faisal *et al.*, 2003). While in semi-intensification was superior to our result both in daily milk yield (9.62±3.09 kg) and lactation length (303.98±6.03 d) according to Musa *et al.*, (2006). The overall lactation mean found was fewer than Iqbal *et al.*, (2009) result on Desi breed (2100.61±163.32 kg/180 day). Mean daily and monthly milk yields obtained here in this study were comparable to Mehta *et al.*, (2010-2011) but his findings were significant. Rather lower means were given by

Faisal *et al.*, (2003) for Kabashi ecotype without significant difference between Winter (2.72; 81.7 kg) and Rainy (2.65; 79.5 kg) seasons, but only significant between the latters and the hot (1.74; 51.1 kg) and worm (2.31; 69.3) summers with an overall season means recording 2.36 and 70.65 kg Babiker *et al.*, (2011) told of significant seasonal influence on daily milk yield in Butana traditionally raised Arabic ecotype (3.16 ± 2.41; 2.88 ± 2.41; 1.23 ±.22 kg) successively in winter, autumn and summer. As in body weights' reveals argumentation between our findings and involved discussionate concerning the significancy of parity and season on milk yield can be arbitrated by the plane of nutrition and herd management status over the seasons, as an strategic criterion highly affecting seasonal differentials.

### Conclusion

We conclude declaring the feasibility of intensive and semi-intensive systemization for the significant enormous emerges throughout the different comparisons held where, they highly-shoot-up in all of the engaged traits' values, opposite to the traditional transhumance or *ad hock* pastoral regimes. Also the result suggest that Darfur Arabic ecotype is ranking high score body weight and growth rate which classify it as meat purposed, but moderate as milk yielder.

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## تقدير أداء بعض الصفات الإنتاجية المهمة لسلالة الإبل العربية الدارفورية تحت نظام التربية المكثف

بدر الدين الوسيلة عبد العزيز و حسنى محمد البشير و محمد حسين محمد البشير و مها أحمد التجانى

مركز تمبول لبحوث الإبل / هيئة بحوث الثروة الحيوانية / الخرطوم العمارات ش1 / الخرطوم/ السودان

### المستخلص

أجريت هذه الدراسة لتقدير أداء بعض الصفات الإنتاجية المهمة لسلالة الإبل العربية الدارفورية المتواجدة فى مركز تمبول لبحوث الإبل الواقع بمنطقة البطانة (شرق و وسط السودان) . المنهجية المتبعة لهذه الدراسة أعتمدت على جمع البيانات المتحصل عليها من خلال سجلات القطيع المتواجد ( ثمانية إناث و اثنين من الفحول والمواليد المتتابعة) خلال الفترة من 2007-2011 م تمت إدارتها تحت النظام المكثف معتمدين فى تغذية القطيع بصورة أساسية على مخلفات صناعة قصب السكر مع إضافة اليوريا والمركبات والأعلاف الجافة. أشارت الدراسة أن متوسط الوزن الحي للذكور البالغة هو  $64.2 \pm 578.40$  كجم فيما بلغ وزن الميلاذ  $5.8 \pm 41.20$  كجم و  $0.82 \pm 40.23$  كجم عند الذكور والإناث على التوالي مع عدم وجود فروقات معنوية. كما سجلت الدراسة معدل النمو أو الوزن المكتسب لمواليد الذكور ما بين شهر الى 24 شهر هو  $-0.37 \pm 1.25$  -  $0.02 \pm 0.49$  على التوالي مقارنة بالمواليد من الإناث التى سجلت معدلات نمو تراوحت بين  $-0.23 \pm 1.16$  -  $0.04 \pm 0.45$  كجم على التوالي مع عدم وجود فروقات معنوية تذكر. علاوة على ذلك أثبتت الدراسة أن كمية الحليب المنتجة تتزايد بزيادة عدد الولادات عند النوق وكان متوسط فترة الحلابة  $95 \pm 276$  يوما. و عليه يتضح من النتائج أعلاه أن سلالة الإبل العربية الدارفورية تمتاز بصفتي إنتاج اللحوم و إنتاج الألبان تحت نظام التربية المكثف.