

Dedication

To:

The soul of my Father Hassan,

The candle of my life my Mother Bosam,

My Brother Dr. Rodwan,

And my Sister Eng. Rabab,

With endless love.

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Abstract

This study was conducted in Khartoum State between January-2010 and June-2013 to assess the productive and reproductive traits of camels as milk production animals. The study covered camel milk properties and nutritive value to make available data base for future planning for research in camel milking efficiency. The methodology followed was included questionnaires in eleven camel farms. Nine farms in Khartoum North and two farms in Omdorman. The questionnaire provided information about (farms, herd owners, herds, herd men, milking, nutrition, watering, housing and marketing) . Two farms of similar system of management and had late stage pregnant she camels of different parity orders were chosen to the experimental work. The first farm (Major Dr. Alaas) is located at Alkadaro, the second farm (Major. Mahjoob) located at Alizba. Seventeen she-camels were chosen from 131 lactating she camels, 132 dry she camels, 131 young females, 72 young males, 8 heifers, 7 adult males and 11 breeder males. One hundred and eighty one milk samples were collected from seventeen individual camel (*Camelus dromedarius*), representing lactation period (after 5 days of parturition). Using StatSoft, Inc. (2011) STATISTICA (data analysis software system) version 10 to analyse the data. Percentage for description of the questionnaire. Taking the farm and the period from day of start of the experiment to day of calving as covariates, the data were subjected to analysis of covariance to test the significance of effect of camel's type on she- camel milk production traits as well as the lactation curve. Matrix of coefficients of correlations of lactation performance traits and lactation curve components of Bushari, Arabi and Anafi. Matrix of coefficients of correlations of lactation performance and milk composition traits of Bushari, Arabi and Anafi breeds.

The survey showed that 81.8% of camel farms were located in Khartoum North and only 18.2% located in Omdurman, 54.5% of farms had milk production as the only purpose of investment. The herding types of camel only and camel with cattle were 36.4%, while herding camel and others represented (27.2%).

Among the camel owners, all of them were more than 40 years old, professionals were 63.6%, investors were 27.3% and amateur were 9.1%. Non-educated camel owner constituted 36.3%, university and post graduate were 27.3% each and the rest were secondary school graduates (9.1%). The majority of the herd men (54, 5%) were educated, while 45.5 were illiterate.

Seven camel breed eco-types were kept in Khartoum State, these were: (ArabiBushari , Rashaidi, Anafi, Kabashi, Kinani and Shukri). That herd size ranged from 12 up to 216 camels with mean (44), the most frequent herd size was (11-20) (36.4%).

All surveyed farms supplemented their camels with concentrates. About (73%) of the farms used green fodder like Abu70 and berseem.

National water net was the most frequent water source (54.5%), followed by wells (36.4%) and canal (9.1%), (54.5%) of farms did not add additives to the water and (36.4%) added bicarbonates and common salt.

100% of milking let down stimulation was done with the presences of the offspring and each she-camel was milked by one milker. Milking all the udder represented (45.5%), high frequency was (81.8%) for she camels milked twice. The study revealed high frequency for lactation period was 12 months at (54.5%). The high frequency average daily milk yield/she-camel was recorded (4 kg/day) at (54.5%).

Camel milk had been processed to Gariss at (63.6%) of the farms while only one farm (9.1%) processed ice cream from camel.

Milk marketing in the farm was the most frequent (54.5%). On the other hand selling milk with 6.5 Sudanese pound / Kg camel milk was the most frequent price at (45.4%).

The total revenue form milk marketing ranged from 0.972 up to 30.912 thousand Sudanese Pound. The study found 6 farms out of 9 were selling the camel milk in the farm gate.

The studied milk production traits of the three types of Sudanese dromedary she-camels. Bushari, Arabi and Anafi she-camels showed that they were similar for offspring birth weight as percent of dam weight ($7.2 \pm 1.20\%$), total milk yield (1932 ± 955 kg) and lactation period (53.3 ± 14.2 weeks). For the milk yield persistency index ($66.8 \pm 14.4\%$), Bushari she camels excelled their Arabi and Anafi. Regarding lactation curve components, Bushari, Arabi and Anafi types of camels had similar initial yield scale (45.4 ± 20.8 kg/week), rate of increase to the peak yield (0.304 ± 0.238 kg/week), week of peak yield (7.6 ± 2.92 week), predicted peak yield (63.5 ± 24.3 kg/week) and persistency of peak yield (4.6 ± 1.17 weeks). Anafi she-camel had lower rate of decrease from the peak yield (0.021 kg/week) than Bushari and Arabi camels (0.037 and 0.052 kg/week, respectively) those were similar. The study estimated the average calving weight 490 ± 15.6 kg and the calf weight (35.2 ± 2.42) kg. The total milk yield correlated positively with all lactation curve component but correlated negatively with constant c and total body changes.

The milk composition of the studied Bushari, Arabi and Anafi she-camels showed that there was no significant differences ($p>0.05$) between the three she camels in moisture, total solids, ash, lactose, Ca, Mg, Na, K and energy value.

The mean for total moisture was ($89\pm 0.27\%$), the mean for total crude protein was ($2.5\pm 0.08\%$), the Bushari breed was significantly higher than Arabi and Anafi in crude protein (2.73%).

The mean for total fat in this study was ($3\pm 0.2\%$). Arabi breed is significantly lower in fat (2.37%) than Bushari and Anafi breed.

The total milk yield correlated positively with all milk composition components but correlated negatively with moisture, lactose and total body changes, while the lactation period correlated negatively with all the milk composition traits.

There was no significant effect of herding type, camel breeds, owner relationship with animals, and herd men education on herd composition percentages in the surveyed farms.

المخلص

اجريت هذه الدراسة في ولاية الخرطوم في الفترة من يناير ٢٠١٠ إلى مايو ٢٠١٣ لتقييم وتحديد انتاج و انتاجية الابل للالبان في النظام المغلق، دراسة خواص والقيمة الغذائية للبن الابل ولتكون قاعدة بيانات اساسية لابعاث مماثلة في المستقبل.

اتبعت طريقة الاستبيانات لاحد عشرة مزرعة بولاية الخرطوم (٩ مزارع بمحلية الخرطوم بحري ومزرعتان بمحلية ام درمان) وتضمن الاستبيان اسئلة عن الاتي (المزرعة، ملاك القطعان بالمزارع، القطيع، الرعاء، الحليب ، التغذية، السقاية، الاسكان والتسويق).

تم اختيار مزرعتين بمحلية الخرطوم بحري (مزرعة الفريق العاص بمنطقة الكدرو) (ومزرعة الفريق محجوب بمنطقة العزبة) واللذان لهما نفس نظام الرعاية وتم اختيار النوق في مراحل حملها الاخيرة من ولدات مختلفة سبعة عشر ناقة اختيرت من قطيع كبير ممثل في الاتي: (١٣١ ناقة حلوب، ١٣٢ ناقة جافة، حاشي انثى ١٣١، ٧٢، حاشي ذكر، ٨ انثى بالغة، ٧ ذكور بالغين، ١١ فحل تلقيح). تم اخذ عينات شهرية من النوق المختارة بعد ٥ ايام من الولادة حيث وصل عددها ١٨١ عينة مثلت فترة الانتاجية وتم تحليلها.

تم استخدام برنامج التحليل الاحصائي STATISTICA (2011) StatSoft, Inc. لتحليل البيانات، النسب المئوية لتحليل البيانات الوصفية للاستبيان.

أوضح الاستبيان ان ٨١.٨% من مزارع الابل بالنظام المغلق تقع في محلية الخرطوم بحري و ١٨.٢% تقع بمحلية ام درمان. ٥٤.٥% من المزارع الهدف الاساسي من الاستثمار هو انتاج الحليب. رعاية الابل فقط والابل والابقار كانت بنسبة ٣٦.٤% بينما رعاية الابل وحيوانات اخرى نسبة ٢٧.٢%.

أفادت الدراسة أن كل مالكي مزارع الابل اعمارهم فوق الاربعين ويمثل الخبراء في انتاج الابل نسبة ٦٣.٣% والمستثمرين ٢٧.٣% اما الهواه فيمثلون ٩.١%. غير المتعلمين منهم ٣٦.٣%، خريجي الجامعات وحاملى الدراسات العليا مثلت نسبة ٢٧.٣% لكليهما وذوي التعليم المتوسط ٩.١%. اما الرعاة فكانت نسبة المتعلمين عالية ٥٤.٥% ام نسبة غير المتعلمين ٤٥.٥%.

سبعة انواع من الابل موجودة بولاية الخرطوم وهي (العربي، البشاري، الرشايدي، العنابي، الكباشي، الكناني، الشكري والرفاعي). أما حجم القطعان كما أشارت نتائج الدراسة فانه يتراوح من ١٢- ٢١٦ بمتوسط ٤٤ واكبر نسبة كانت ٣٦.٤% للقطعان من ١١-٢٠ راسا.

كل المزارع في هذه الدراسة تم الايل بالمركزات وحوالي ٧٣% منهم يستخدمون ابوسبعين والبرسيم. اكبرنسبة كانت للمزارع التي تعتمد على هيئة مياه الخرطوم ٥٤.٥% اما مستخدمي الابار فنسبتهم ٣٦.٤% والترعة بنسبة ٩.١%. في الدراسة الحالية ٥٤.٥% من المزارع لا تقوم باي اضافات لمياه الشرب للابل اما نسبة ٣٦.٤% من المزارع تتم اضافة بيكربونات الصوديوم والملح.

وجدت الدراسة الحالية ان كل التحفيز لادرار اللبن يتم بوجود الحاشي وكل ناقة يتم حلبها بواسطة حلاب واحد. الحلب الكامل للضرع مثل نسبة ٤٥.٥% واعلى نسبة كانت لحلب الناقة مرتين في اليوم ٨١.٨%. توصلت الدراسة الى ان ١٢ شهر هو طول موسم الحليب بنسبة ٥٤.٥%.

عن الإنتاج اليومي من الحليب للناقة فقد أوردت الدراسة الرقم ٤ كجم من الحليب يوميا في المتوسط بنسبة ٥٤.٥%. والغالبية العظمى من المزارع تقوم بتصنيع لبن الابل لقارص ٦٣.٦% ومزرعة واحدة صنعتها لايسكريم ٩.١%.

٥٤.٥% هي نسبة تسويق حليب الابل من داخل المزرعة بسعر ٦.٥ جنيه سوداني للكيلو من الحليب هو الشائع بنسبة ٤٥.٤%. ويتراوح عائد الربح الكلي لتسويق حليب الابل من ٩٧٢ - ٣٠.٩١٢ مليون جنيه سوداني.

توصلت دراسة انتاجية الحليب لثلاث سلالات سودانية وهي البشاري و العربي والعنابي تضمنت: (انتاجية الحليب وموسم الحليب، قمة منحني الحليب المشاهد، ومعامل المثابه، وزن المولود والتغير في الوزن الكلي للنوق خلال موسم الحليب) الى انه يوجد تماثل بين الثلاث سلالات من حيث نسبة وزن المولود الى وزن الام (٧.٢ ± ١.٢%)، والانتاج الكلي للحليب خلال الموسم (955 ± 1932) كيلوجرام وطول موسم الحليب (53.3 ± 14.2) اسبوع . اما بالنسبة للمثابه لانتاج الحليب (66.8 ± 14.4%) حيث تفوقت الابل البشارية على مثيلاتها العربية والعنافية.

اما بالنسبة لمنحني انتاج الحليب فلقد تماثلت السلالات الثلاث في الانتاج الابتدائي للمنحني (45.4 ± 20.8) كيلوجرام/الاسبوع، وعدل الزيادة في المنحني صعودا لقمة الانتاج بمعدل (0.304 ± 0.238) كيلوجرام في الاسبوع، اسبوع قمة الانتاج (7.6 ± 2.92) اسبوع ، قمة الانتاج الفعلي (63.5 ± 24.3) كيلوجرام/الاسبوع، والمثابه عند قمة الانتاج (4.6 ± 1.17) اسبوع . وظهرت السلالة العنافية ببطء في المنحني النازل من منحني الحليب عن السلالة البشارية والعربية.

توصلت الدراسة الى ان متوسط وزن النوق عند الولادة بلغ (490 ± 15.6) كجم ووزن المواليد عند الولادة (35.2 ± 2.42) كجم.

وجدت الدراسة ارتباط موجب معنوي بين معدل الانتاج الكلي مع كل مكونات منحنى الحليب ما عدا منحنى الحليب النازل ومعدل التغير الكلي في الوزن بالنسبة للنوق.

مكونات الحليب للسلاسل الثلاث البشاري والعربي والعنابي اوضحت بعدم وجود فروق معنوية بينها عند ($p>0.05$) لكل من الرطوبة والمواد الصلبة الكلية والرماد واللاكتوز والكالسيوم والماغيسيوم والصوديوم والطاقة الكلية.

اما متوسط الرطوبة في الدراسة الحالية فمثلت نسبة (0.27 ± 0.89)، و متوسط نسبة اللاكتوز (4.7 ± 0.1)، ومتوسط نسبة الرماد الكلية (0.02 ± 0.9)، ومتوسط نسبة الكالسيوم (0.08 ± 0.5) ومتوسط المايسيوم الكلي (0.03 ± 0.13) ومتوسط الصوديوم الكلي (0.20 ± 0.20) ومتوسط البوتاسيوم الكلي (0.04 ± 0.34).

ومتوسط نسبة الكلية للبروتين الخام (0.08 ± 2.5)، وظهرت سلالة البشاري معنوية عالية عن العربي والعنابي في البروتين الخام (2.73%).

ومتوسط النسبة الكلية للدهون (0.2 ± 3) وظهرت الدراسة ان سلالة العربي ذات معنوية اقل في الدهن عن البشاري والعنابي (2.37%).

ووجدت الدراسة ان معدل الانتاج الكلي للحليب يرتبط ايجابيا مع مكونات اللبن وسلبيا مع الرطوبة واللاكتوز والتغيرات في الوزن الكلي للجسم، وبينما طول موسم الحليب يرتبط سلبيا مع مكونات الحليب