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Effect of Lactation Camel Supplements with Feed on Milk Yield and It's Constitute Under Conditions of Khartoum, Sudan

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Abstract

The aim of this study is to investigate the effect of lactation camel supplements with feed on milk yield and its constitute under conditions of Khartoum, Sudan. A total of 120 she-camels were used in three cities in Khartoum state: Bahri, Khartoum, and Omdurman, with forty she-camels in each city. Each camel in the group feeding was offered a basic ration of 2 kg containing 17% crude protein (CP) and 12% metabolism energy (ME). Before the trial, the average milk productivity per camel was 5.1 liters/day, 6.3 liters/day, and 7.6 liters/day in Khartoum, Omdurman, and Bahri, respectively. However, the supplement had the effect of increasing the milk yield to 9.2 liters/day (56%), 11.5 liters/day (55%), and 15.3 liters/day (49%) for the camels in Khartoum, Omdurman, and Bahri, respectively. Statistical analysis (ANOVA) indicated that the results were highly significant ($P<0.01$). It was concluded that grazing camels for seven hours per day and providing them with a supplement in fences increases milk yield. Adding concentrated feed after grazing provides an abundance of nutrients that are converted into milk. This is because the intestine is poor and does not meet the animals' needs, and the hours of grazing are not enough to cover the animals' needs. The research recommended adopting a semi-intensive system for better milk production and performance.

Keywords: Feeding, Yield, Camel Milk, Supplement, Khartoum state.

Introduction

The Middle East and North Africa (MENA) are known for their dry and challenging landscapes, making them hostile ecosystems for many livestock species **(Harbi, 1992; Sabia, 1999 and Egbalet al., 2011)**. Camels play a crucial socio-economic role in the arid and semi-arid areas, particularly among smallholder farmers in Africa **(Shuiep et al., 2011)**. Camel production is significant in Sudan due to the high population and the need for milk, meat, and therapeutic values **(Sabialm, 1999)**. The global camel population is approximately 19 million, with 15 million in Africa and four million in Asia **(FAO, 2020)**. Additionally, 17 million of the camels are dromedaries, while two million are Bactrian **(Yagil, 2006)**. The estimated population of camels in Sudan is 4.8 million heads **(MARF, 2020)**. Camels are distributed in North Kordofan, North Darfur, Central State, and North Darosa **(A.E.M, 2005)**. They can be classified according to their environment, such as desert, plains, and mountain camels, as well as by their originality and degree of ethnic purity **(Ishag et al., 2011)**. They can also be categorized by production or nature of work, such as milk and meat production **(Zayed, 2012)**. In the intensive production system, camels are fed silage grasses, legumes, maize, and herbal materials to produce more homogeneous materials and concentrates include various grains **(Bakhit, 2009)**. In addition, all experimental she-camels were fed on a supplemented ration during the experiment and milked once a day to determine their milk yield **(Zayed, 2012)**. The research problem lies in the severe deficiency in dairy productivity despite the expansion of pastures, agricultural lands, fodder, and the number of animals, with productivity reaching only 10% of dairy products (studies by **the Arab Organization for Agricultural Development, 2020**). Many Arab and foreign countries have turned to camels to improve their vertical and horizontal productivity in desert and semi-desert areas for dairy production **(Schwartz and Dioli, 2014)** as well as to transfer appropriate technologies and overcome problems and obstacles resulting from economic, social, and political factors leading to environmental degradation.

Materials and Methods

The research was conducted around the city of Khartoum in the localities of Khartoum, Bahri and Omdurman in the period from November 2020 to January 2021 on the semi-intensive system. The study was carried out at the Animal Production Department Laboratory, Faculty of Agriculture Technology and Fish Sciences, University of Al-Neelain.

Supplementary feed

The camels were given a concentrated diet regularly. The group grazed on the trees in the pasture and takes samples from the salm, sial, samr, and tundob trees (Table 1). The area where the research was being conducted was under the semi-intensive system (Table 2). The animals grazed for 7 hours a day and received an additional 2 kilograms of diet.

Table 1. Laboratory analysis of vegetation and manure.

AvailablePasture		DM	Ash	CP	E-E	CF
Latin Name	Local Name					
Acacia tortils	سمر	93.1	10.95	10	2.8	44
Acacia falva	السلم	93.4	4.5	10.135	3.2	42
Acacia radiana	السيال	94.1	6.48	10.98	2.8	50
Capparis decidua	الطندب	94.4	8.9	10.77	1.6	48.5

Table 2. The fodder used.

Groups	TS	DM	CP%	Fiber	ASH	NFE	ME	CA%
Ground nut cake	12	94.6	46.5	2.1	9.7	2.6	12	0.7
Dura	12	94.5	14	2.9	2.3	7.8	13.6	0.05
Wheat bran	38	93.5	18	13.6	5.9	52	11.2	0.2
Ground nuthug	20	95.5	8.1	35.5	11.4	42.5	0.18	0.18
Molasses	15	73.5	4.8		16.5	78.8	0.9	0.9
Ca	2	-	-	-	-	-	-	-
Nacl	1	-	-	-	-	-	-	-

Milk yield and composition

Samples of camel milk have been collected at different times in the morning and evening, and they are currently being analyzed at Al-Nilein University in the College of Agriculture laboratory. The milk samples are stored in small bottles and placed in a large container with ice to ensure preservation and prevent contamination until the samples are analyzed in the laboratory. The analysis includes determining the percentages of protein, ash, total solids, moisture, acidity, fats, and lactose.

Statistical Analysis

The obtained data were statistically analyzed according to statistical analysis system **(SAS, 2003)**. Least Significant Difference (LSD) distinguished the differences among means and significant level was set at 5%.

Results and Discussion

The Effect of camel feed supply on average milk yield (liter/day) in different study areas in Khartoum governorate are presented in Table 3.The results showed that providing supplementary feed to lactating camels after 7 hours of grazing significantly.

Table 3. Effect of camel feed supply on average milk yield (liter/day) in different study areas in Khartoum governorate.

Area	Before feed supply	After feed supply	% of increasing
Khartoum	5.1	9.2	56
Omdurman	6.3	11.5	55
Bahri	7.3	15.3	49

increased the average milk yield across all study areas, as well as the percentage increase. These results may be attributed to the fact that adding concentrated feed after grazing provides more nutrients that are converted into milk. The pasture may be poor and not meeting the animals' needs, and the duration of grazing might not be sufficient to fulfill the animals' requirements. The poor quality of the grazing pasture in the selected areas may have resulted in insufficient available feeds and nutrients.

In a related study, **Shuiep et al. (2011)** reported that natural pasture alone did not provide sufficient nutrition for camels, and that a basic ration with high concentrate feeding, along with grazing in a semi-intensive system and feeding in natural pasture, led to better utilization of the supplement feeding and selection of specific trees with high physiochemical properties, such as Acacia tortilis, Acacia flava, Acacia radiana, and Capparis decidua. This result is in line with **Hasabo et al. (2013); Zayed (2012); Suliman (2012); and Abdelrahman et al. (2016)**. They found that supplying grazing camels with extra feed resulted in increased milk production.

In terms of the effect of grazing area, the highest average milk yield was recorded for lactating camels grazed in the open system of Bahri area (7.3 liters/day), followed by the average milk yield for lactating camels grazed in Omdurman area (6.3 liters/day). The lowest average milk yield was recorded for lactating camels grazed in Khartoum area (5.1 liters/day), showing significant differences among the different areas. The same trend was observed for average milk yield after adding feed supply. The recorded average milk yield after feed supply was 15.3, 11.5, and 9.2 liters/day for Bahri, Omdurman, and Khartoum, respectively, with a 56%, 55%, and 49% increase in Bahri, Omdurman, and Khartoum, respectively.

The results presented in Table 4 showed that supplying lactating camels with feed led to a significant increase in milk total solid percentage, ash percentage, lactose percentage, and pH value compared to lactating camels that were not supplied with feed in all experimental areas (Bahri, Omdurman, and Khartoum). Adding concentrated feed after grazing provides more nutrients that are converted into milk. This is because the pasture is poor and does not meet the animals' needs, and perhaps the number of hours of grazing is not enough to cover the animals' needs.

Table 4. Effect of camel feed supply on milk constitute in different study areas in Khartoum governorate (Means ± Standard deviation (Std).

	Khartoum		***Bahri***		***Omdurman***		**LS**
	Mean±Std		**Mean±Std**		**Mean±Std**		
	Before feed supply	**After feed supply**	**Before feed supply**	**After feed supply**	**Before feed supply**	**After feed supply**	
Moisture, %	88.4±1.2	88.9±0.4	88.2±1.0	87.5±0.2	87.4±1.2	87.9±0.3	**
Total solid, %	11.6±0.6	11.1±0.4	11.8±0.5	12.5±0.3	12.6±0.5	12.1±0.4	**
Acidity	0.36±0.7	0.34±0.12	0.35±0.6	0.34±0.10	0.36±0.7	0.34±0.1	**
PH \ temp (27.5c°)	4.32±0.37	5.77±0.84	4.30±0.35	5.75±0.82	4.30±0.35	5.77±0.8	**
Protein (%)	3.95±0.43	3.51±0.21	3.90±0.41	3.50±0.20	3.95±0.43	3.50±0.2	**
Lactos(%)	3.3	3.26	3.57	4.79	4.3	4.4	**
Ash (%)	0.62± 0.05	0.67±0.01	0.61 ±0.05	0.66±0.00	0.62± 0.05	0.67± 0.00	**
Fat (%)	3.73± 0.49	3.56±0.25	3.72±0.48	3.55±0.24	3.73 ±0.49	3.55± 0.25	**

LS = Levels of significance.

Also, the results showed that providing feed to lactating camels led to a significant decrease in milk protein and fat percentages compared to lactating camels that were not provided with feed in all experimental areas (Bahri, Omdurman, and Khartoum). Additionally, the highest mean was recorded in the Khartoum area (87.4 and 88.9) before and after the supplement, respectively. This finding is consistent with **Zayed (2012)**, who reported that the total solid content of camel milk was 11.6%. However, this contradicts the findings of **Sabil (1999); Yagil (2006)**; **Eisa et al. (2010)** and **Zayed (2012)**. It was observed that all the chemical and physical properties of the milk yield (moisture, total solid, density, acidity, pH, protein, fats, and ash) varied significantly during natural feeding and after supplement feeding. This observation aligns with the findings of **Bakhiet (2009) and Hasabo et al. (2020)**.

The results of the statistical analysis presented in the Table 5 indicate significant differences at the 0.05 level between the feeding groups and feeding periods, as well as the interaction between them. These differences are a result of the behavior of the camels and the feeding method, which is determined by the movement of the herd. This confirms **Salam (2000)** on the importance of raising camels in the semi-intensive sector, as well as the findings of **Musa et al. (2003)**, which indicate that camels are distinguished by their

ability to benefit from poor natural pastures and additional concentrated feed. The percentage of fat, ash, protein, and solids was affected by different feeding systems due to the variation in milk components based on the number of milking, type of feed, and tree consumption.

Table 5. A comparison of the total solid, protein, fat, ash, and lactose yields in the three areas of Khartoum Governorate (Means ± Standard deviation (Std)).

	Khartoum		***Bahri***		***Omdurman***		
	Mean		**Mean**		**Mean**		**LS**
	Before feed supply	**After feed supply**	**Before feed supply**	**After feed supply**	**Before feed supply**	**After feed supply**	
Total solid/ yield, g/day	2.187	1.160	1.554	0.786	1.923	1.011	**
Protein /yield,g/day	0.745	0.367	0.395	0.219	0.603	0.292	**
Fat /yield,g/ day	0.703	0.372	0.395	0.223	0.569	0.297	**
Ash/ yield, g/day	0.117	0.0700	0.0489	0.0415	0.095	0.0560	**
Lactose/yield ,g/day	3.3	3.26	3.57	4.79	4.3	4.4	**

LS= Levels of significance.

Conclusion

The productivity of lactating camels under traditional grazing systems in the studied areas is very low due to insufficient nutrient supply for the pasture. To increase animal productivity and maximize profit in this system, it is necessary to supplement nutrients by feeding the lactating camels. Supplementing the lactating camels with a basic ration (CP 17%, ME 12%) can result in a significant increase in milk yield and milk constituent yield. Adding concentrated feed after grazing provides an abundance of nutrients that are converted into milk. This is because the intestine is poor and does not meet the animals' needs, and also the hours of grazing are not enough to cover the animals' needs. The research recommends adopting the semi-intensive system for better milk production and performance.

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