RELATIONSHIP OF UDDER MEASUREMENTS TO MILK YIELD IN MAJAHEEM AND MAGHATEER CAMELS

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INTRODUCTION

In the arid areas where other livestock finds difficult to survive, camel maintain potentiality in terms of meat and milk production **(Morton, 1984; Mal et al., 2006)**. Camel milk is supposed to have nutritive **(Knoess, 1984)**, as well as medicinal properties **(Yagil, 1982; Mal et al., 2006)**.

A study of Saudi camels in their second calving from each of Majaheem, Maghateer and Awarick camel types were managed under similar conditions compare their milking performanee in ten months lactation period. All camels achieved peak lactation yields at the fourth month of lactation. Total lactation yields were 1047.5 ± 11, 2576.3 ± 24.5 and 1748.9 ± 18.5 kg in Awarick, Majaheem, and Maghateer camels, respectively. Awarick camels had more water and less fat in their milk compared to Majaheem and Maghateer camels that yielded milk of more or less similar composition **(Gaili et al., 2000)**.

The udder of the eow-camel like that of cattle consists of four quarters, eaeh with it's own teat. A well developed mammary system comprises one of the major component of the dairy animal score eard **(Mishra et al., 1976)**. Furthermore, dairy camels are characterized by development of the udder and milk veins **(Wardeh et al., 1990)**, accordingly, well developed milk veins may reflect a greater milk secreting potential. **Zayeed et al., (1990)** demonstrated that, therc is a great variation in udder and teat size and length in the cow-camel, which may be attributed to variable factors including, camel type, lactation stage, parity number and disease.

The present study was designed to investigate the eorrelations between some udder and teat measurements with milk yield in Majaheem and Maghateer breed.

MATERIALS AND METHODS

Animals:

Ten newly calving from each of multiparus Majaheem and Maghateer eamel breed were used for the study. Animals were fed experimental diet (table 1) and had free access to water and salt licks. All animals were at their third laetation.

Data collection:

Daily Milk Yield:

Daily milk yield was measured using a measuring cylinder. The part of the milk left

for the young calves in the udder was not counted in the daily milk yield and therefore was not included in the calculations.

Udder Measurements:

Each measurement in the present study was taken twice before milking and the average of the two readings was then adopted as the base of calculations.

The widest horizontal circumference aeross the udder was taken as the udder circumferenee. The size of the udder was estimated by multiplying it's horizontal circumference with the udder depth **(Maskovskaja, 1967)**. The udder height was defined as the distance from the ground to udder floor at the points directly in front of the fore and rear teats. Levelness of the udder floor was measured as the difference between the fore and rear udder heights.

Teat measurements:

The teat Length was measured as the between the base of the teat to the tip of the teat, by stretching the tape a long the teat. Teat diameter was measured with a vernier caliper at the middle point of the teat. Distance between teats was defined as the distance between the fore teats, rear teats, right teats and left teats was estimated by measuring the distance between every two teats from the middle point of the teats.

Milk Vein Measurements:

The linear length of the milk vein was recorded by measuring the linear distance in straight line covered by the milk vein visible in front of the fore quarters up to the milk well where the vein entered in to the abdomen. Milk vein diameter was measured with a vernier caliper.

Statistical analysis:

Data were analysed by one-way analysis of variance (ANOVA) using GLM procedure of SAS **(Goodnghit et al., 1986)** and Duncan's multiple range test **(Duncan, 1955)** was used to detect differences between breeds. Pearson's correlation coefficient was used to calculate the relationship of udder and teat measurements and milk vein with the daily milk yield.

RESULTS

The daily milk yield, udder measurements and milk vein measurements are given in Table 2. Significantly $P<0.05$ higher daily milk yield was observed in Majaheem compared to Maghateer. Udder depth, circumference and size and teats length and diameter were significantly ($P<0.05$) higher in Majaheem than in Maghateer. Likewise, the milk vein length and diameter was significantly ($P<0.05$) greater in Majaheem than in Maghateer. Pearson's correlation of daily milk yield with udder, teats and milk vein measurements are given in Table 3. Udder depth size, distance between right and left teats and milk vein diameter measurements were significantly positively ($r = 0.6$-0.7; $P<0.05$) correlated with milk yield. Teats diameter, distance between fore and rear teats were significantly negatively ($r = -8$ to -6; $P<0.05$) correlated. Other parameter of udder and teats measurements were either positively or negatively correlated, though not significant.

DISCUSSION

The daily milk yield of Majaheem was

significantly greater than Maghateer. Similar values was reported in Saudi camels (**Saoud, et al., 1988; Gaili, et al., 2000**). However, lower daily milk yield was reported for Desert camels **(Capot-Ray, 1962)**, Ethiopian camels **(Kness, 1989)** and Indian camels **(Mehta et al., 2009)**. Udder depth, circumference and size, teats length and diameter and milk vein measurements were also greater in Majaheem than Maghateer suggesting that conformation of the udder can change according to breed **(Tibary and Anouassi, 2000)**.

Significant positive correlation between milk yield and udders depth, size and milk vein diameter was observed in two breeds. Significant correlation between milk yield and udder depth **(Akhtar and Thakuria, 1998)**. Size **(Bogatyreva, 1970)** and diameter of milk vein **(Weiss et al. 2004)** was also reported. Depth of the udder and diameter of milk vein are among the criteria for selection of dairy camel **(Tibary and Anouasi, 2000)**. Indeed, the optimal blood flow is critical to the function of mammary gland **(Gorewit et al., 1992)**. Correlation of milk yield with teats measurements, through negative, was also demonstrated in the present study. Similar results were reported in dairy cows (**Wojcik and Czaja, 2002, Weiss et al., 2004**).

In conclusion, the present study demonstrated that the udder, teats and milk vein measurements could have a direct impact on milk yield in dairy camel. Further studies on the effect of parity, age of animals, stage of lactation on milk yield are underway.

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Table 1 : Ingredients and chemical composition of experimental diet .

Ingredients	DM basis %
Maize	36.6
Alfalfa hay	26.6
Barley	24.9
Soybean meal	8.9
Mineral supplement	2.8
Trace mineral and vitamin premix	0.2
Chemical Composition	
CP	14.82
CF	7.9
ADF	15.25
NDF	50.2
NFE	66.5
EE	2.21
Ash	5.9
ME (Mcal/kg)	2.67

Table 2 : Milk yield and udder measurements in Majaheem and Maghateer camels .

Parameter	Majaheem (n=10)	Maghateer (n=10)
Daily milk yield (kg) Under measurements (cm)	8.53±1.6	5.81±0.7
Depth	20.2±1.2*	17.2±1.4
Circumference	92.1±2.4*	102.7±4.5
Size (cm^3)	2220±74.3*	1618.2±64.1
Height of forequarter	112.6±2.1	101.1±3.1
Height of rare quarter	111.4±2.3	99.1±3.2
Levelness	1.2±0.6	2.0±1.2
Teat measurements (cm)		
Fore length	8.1±0.6*	6.2±0.7
Rear length	8.0±0.6*	6.1±0.6
Fore diameter	4.2±0.3*	2.5±0.2
Rear diameter	4.3±0.3*	2.7±0.1
Distance between right teats	3.8±0.2	3.1±0.1
Distance between left teats	3.8±0.2	3.2±0.1
Distance between fore teats	10.4±0.8	8.1±0.5
Distance between rear teats	10.4±0.8	8.2±0.5
Milk vein measurements (cm)		
Length	97.2±2.3*	89.2±2.1
Diameter	2.6±0.03*	1.7±0.04

- Significantly different at $P<0.05$.

Table 3 : Correlation between Milk yield and udder and teat measurements in Majaheem and Maghateer camels.

Parameter	Majaheem (n=10)	Maghateer (n=10)
Under measurements (cm)		
Depth	0.701*	0.651*
Circumference	0.411	0.391
Size (cm^3)	0.611*	0.591
Height of forequarter	-0.112	-0.212
Height of rare quarter	-0.172	-0.05
Levelness	-0.166	-0.221
Teat measurements (cm)		
Fore length	0.312	0.011
Rear length	0.123	0.122
Fore diameter	-0.722*	-0.841*
Rear diameter	-0.862*	-0.788*
Distance between right teats	0.781*	0.695*
Distance between left teats	0.641*	0.688*
Distance between fore teats	-0.712	-0.699*
Distance between rear teats	-0.611	-0.614*
Milk vein measurements (cm)		
Length	0.211	0.131
Diameter	0.621*	0.611*

- Significantly correlated at $P<0.05$.

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الملخص العربى

العلاقة بين إنتاج اللبن ومقاييس الضرع فى أبل المجاهيم والمغاتير

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أجريت هذه الدراسة على ١٠ نوق حديثى الولادة (الموسم الثالث) من كل من أبل المجاهيم والمغاتير لقياس إنتاج اللبن ومقاييس الضرع والحلمات وإنتاج اللبن فى كل من السلالتين وإيجاد العلاقة بين كل من هذه المقاييس السابقة.

ولقد أظهرت النتائج تفوق أبل المجاهيم فى إنتاج اللبن معنوياً ($P<0.05$) على مثيلاتها من أبل المغاتير، وكان إرتفاع الإنتاج مصحوباً بزيادة معنوية ($P<0.05$) فى عمق وحجم ومحيط الضرع وكذا طول وقطر الحلمات، وكان الارتباط الظاهرى موجب - مرتفع ومعنوى ($P<0.05$) (٠,٦ - ٠,٧) بين عمق الضرع والمسافة بين الحلمات اليمنى واليسرى وسمك وريد اللبن، وعلى العكس كان هناك إرتباطاً سالباً - مرتفع ومعنوى ($P<0.05$) (-٠,٦ - ٠,٧) بين قطر الحلمات والمسافة بين ربع الضرع الأمامى والخلفى، ولم تظهر باقى المقاييس والعلاقات بين مقاييس الضرع والحلمات أى إختلافات معنوية ($P>0.05$).

وخلاصة القول - أظهرت هذه الدراسة أن مقاييس الضرع والحلمات ووريد اللبن يكون لها تأثير مباشر على إنتاج اللبن فى الإبل مع التوصية بدراسة التأثير على موسم الحليب وتأثير العمر وكذا مرحلة الحليب.