THE POTENTIALITY OF MILK PRODUCTION AND LACTATION CURVE IN DHOFARI GOAT

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SUMMARY

Records of 233 Dhofari does, progenies of 40 sires, were available for this study. The present study was carried out in the Livestock Research Station at Salalah, Sultanate of Oman. During the inception phase, this flock has been composed of four suggested ecotypes; Elwasat, Elsharkiya, Elgharbiya and Najd. The objective of this study was evaluating the potentiality of these suggested ecotypes and hence the potentiality of Dhofari goat towards milk production, assessing the effect of ecotypes and lactation years on some milk production traits as well as characterize the lactation curve and its parameters together with those factors affecting it. Milk production data were recorded from does in their first lactation season in two successive years. The present study dealt with total milk yield (TMY), the 90 days cumulative milk yield (M90), lactation period (LP), persistency (PR), the lactation curve peak of production and lactation curve parameters (a, b and c) according to the Wood nonlinear model.

The present study estimated least square means of TMY and M90 as 51.08 kg and 26.56 kg, respectively. Results indicated highly significant impact of lactation year on TMY, M90 and PR. Among all lactation curve parameters, ecotype and lactation year have only significant effects on "a". The first year of lactation was always higher than the second one for these traits. Furthermore, the shape of lactation curves for Dhofari goat was described to have initial milk production of 0.217 kg, a rate of ascending phase of 0.83 kg/week and a decline rate of -0.14 kg/week during the descending phase. LP was about 32 weeks (226.10 days), the actual peak milk yield of 0.37 kg has been initiated at about 4.3 weeks and terminated at a peak milk yield of 0.41 kg in 11.6 weeks, and then the curve tended to decrease gradually until the end of lactation with an average persistency of 64.17%. Heritabilities of TMY, M90 and PR were estimated as 0.08, 0.05 and 0.46, respectively. Genetic and phenotypic correlations between M90 and TMY were 0.60 and 0.86, respectively.

The present study provides evidence that Dhofari goat possess a promising potential for milk production that could response to genetic improvement process and recommends pooling the studied four ecotypes together as a Dhofari goat breed.

INTRODUCTION

In Sultanate of Oman, animal production is a growing sector to meet the increasing consumption of animal products in the country. Goat and sheep are raised mainly for meat production with milk as a secondary product. Dhofari goat is a native breed dominates the southern part of the country, Dhofar governorate. Among all Omani breeds, Dhofari goat seems promising particularly for milk production; however, scanty data are available on the characterization and performance of that breed. Earlier, a study had been conducted regarding the potentiality of Dhofari goat towards meat production (ElGabbas and Anous, 2001). Genetic and phenotypic parameters for milk production need special emphasis to be developed as dairy or dual purpose goat (milk and meat). Thus, the present study investigated the potentiality of that breed towards milk production. Improving milk yield is an important component of an overall strategy to enhance profitability and sustainability of Dhofari goat. Milk products are not only an important source of crude protein for consumers but can also provide producers with a supplementary income for rural development.

The economy of goat production system usually depends on the improvement of meat and milk production which is strictly tied to the

conducted selection program in order to achieve high efficiency. The present study was carried out to analyze the preliminary results obtained during the inception phase of establishing the Dhofari goat flock, in order to (1) evaluate the potential milk production capacity of Dhofari goat. (2) evaluate the effect of some environmental factors influencing some milk production traits, and (3) characterize the lactation curve and its parameters as well as those factors affecting it.This information might help in planning for genetic improvement schemes for Dhofari goat.

MATERIALS AND METHODS

The present study was carried out on Dhofari goat flock kept in the Livestock Research Station (LRS) at Salalah, belonging to the Ministry of Agriculture and Fisheries. During the inception phase of establishing this flock, it was observed that there is four types of Dhofari goat originated from various regions in Dhofar Governorate; Middle (Wasat), East (Sharkiya), West (Gharbiya) and Najd. Local inhabitants talk about differences in some productive performance among these types, while the main difference is probably exists in coat colour. Brown colour dominates in Sharkiya goat, Najd goat are mainly white, Gharbiya goat are mostly black with white spots while Elwasat goat have mixture of colours dominated by brown coat. These groups were identified as ecotypes representing those regions from which they came from. It was hypothesized that these ecotypes are different sub-classes from Dhofari goat and probably varies in their productive performance. Therefore, these four ecotypes were collected from various regions of Dhofar Governorate; Sharkiya, Gharbiya, Wasat and Nejd and brought together to evaluate their performance at LRS under the same management system. The present study would deal with these four ecotypes to explore whether any differences are existed among them as far as milk production is concerned.

Flock management

Animals were housed in semi open pens. They were fed mainly with concentrate ruminant mixture together with hay at *ad lib* bases. The does were supplemented with 0.500 kg/day/head of concentrate mixture for two weeks before the mating season and during the last four weeks of pregnancy. Milking goats were supplemented with 0.750 kg/ day/ head of concentrate mixture while the rest were fed on 0.200kg/day/head. Water was made available all the time in water troughs inside each pen. Feed, management and breeding practices were described elsewhere (Elgabbas and Anous, 2001).

After parturition, kids were kept with their dams during the first week to freely suckle the colostrum. Milk yield was recorded from the second week after parturition up to the end of lactation when their milk yield fell to about 0.025 kg/day and they had to be dried off. Kids were kept with their dams till weaning at approximately 120 days. During the pre-weaning stage, kids were separated and prevented from suckling mothers for a period of 12 hrs prior to measuring milk yield, after which all does were hand-milked once a day in the morning. Milk yield was recorded twice a week at a regular basis throughout the lactation period. The average quantity of the recorded two milkings was calculated every week and regarded as a representative of daily milk yield per week. That average was multiplied by seven to estimate the weekly milk yield for that animal. The 90 days cumulative milk yield (M90) was the sum of the 13 individual weekly milk yield. Total milk yield (TMY) was the sum of all individual weekly milk yield throughout the lactation period.

Data

Records of 233 Dhofari does, descendants of 40 sires, were used for this study with their corresponding pedigree. The data set consisted of 14 590 lactations weekly yield. Milk production data were recorded from does in their first lactation season in two successive years, since the number of those having second lactation season were too little, so they were excluded from the data set. Thus, the data consisted of does in their first lactation season during the first (66 does) and second years (167 does). The present study

investigated the effect of lactation year and ecotypes on TMY, M90, lactation period (LP), persistency (PR), peak of lactation curve and lactation curve parameters (a, b and c). According to Wood (1967), the shape of lactation curve could be described through three parameters "a" (initial milk yield), "b" (rate of increase to peak during the ascending phase) and "c" (rate of decrease during the descending phase). LP indicates the sum of days in lactation from the second week after parturition until the moment when the daily milk per head decreased to 0.025 kg, yet had to be dried off. Persistency of lactation (PR) expresses the ability of a lactating animal to maintain milk production at a high level after reaching the yield peak.

Statistical analysis

Analysis of variance was carried out for the data to split the total variance into its components by the least-square technique using the Proc. GLM of SAS (2002). Comparisons among subclass means were also carried out following Duncan's multiple range test (SAS, 2002). The following mathematical model included fixed effect of lactation year and ecotypes.

$$Y_{ijk} = \mu + C_i + L_j + (CxL)_{ij} + E_{ijk}$$

Where, Y_{ijk} is the observation of the studied traits of k^{th} animal of i^{th} ecotype and j^{th} lactation year; μ is the overall mean; C_i is the fixed effect of ecotype (1= Elwasat, 2= Elsharkiya, 3= Elgharbiya and 4= Najd); L_j is the fixed effect of lactation year (1= first year and 2= second year); $(CxL)_{ij}$ is the fixed effect of ecotype x lactation year interaction and E_{ijk} is the random residual error.

The Animal model (derivative-free restricted maximum likelihood: DFREML, Meyer, 1997) was used to analyze data of milk yield according to the following model:

$$y = Xb + Z_a a + Z_c c + e$$

Where: y = Vector of observations, X = Incidence matrix relating fixed effects to y, b = Vector of an overall mean and fixed effects (ecotype, lactation year and lactation period as a co-variable), Z_a = Incidence matrix relating direct additive genetic effects to y, a = Vector of random effect (direct additive genetic associated with the incidence matrix Z_a, Z_c = Incidence matrix for permanent environmental effect, c = Vector of permanent environmental effect associated with the incidence matrix Z_c and e = Vector of random residual effects N (0, $I\sigma^2 e$); I is an identity matrix. The variance-covariance of the random effects was as follows:

$$Var \begin{bmatrix} a \\ c \\ e \end{bmatrix} = \begin{bmatrix} A\sigma^2 a & 0 & 0 \\ 0 & I_c\sigma^2 c & 0 \\ 0 & 0 & I_n\sigma^2 e \end{bmatrix}$$

Where: A = Numerator relationship matrix, I_c, I_n = Identity matrix with order equal to number of animals and number of records, respectively.

For describing the lactation curve, the logarithmic gamma-type function of Wood (1967) was used (SAS, 2002).

$$Ln (Yn) = Ln (a) + b Ln (n) - cn$$

Where: Y_n = Total weekly milk yield (kg), n= Week (s) of lactation, a= Initial milk yield (kg), b= Rate of increase to peak during the ascending phase (kg/week) and c= Rate of decrease during the descending phase (kg/week). The Persistency (PR, %) have been calculated as PR= [(Milk yield in 28 weeks – Milk yield in the first 14 weeks)/ Milk yield in the first 14 weeks)] x 100.

RESULTS AND DISCUSSION

The obtained results (Tables 1 and 2) show that least square means of total milk yield (TMY) and the 90 days cumulative milk yield (M90) were 51.08 and 26.56 kg, respectively, throughout the lactation period (LP) that extended to 226.10 days (about 32 weeks) with a persistency (PR) of 64.17%. The M90 represents 52.0% of the TMY. The present estimate of TMY seemed to be less than 150.79 kg which found in Indian Jamnapari does (Roy and Mandal, 2010). Significant breed differences in TMY were indicated in Turkish sheep where Morkaraman breed has an average TMY of 50-65 kg within a LP of 140-150 days, Awassi sheep has an average

TMY of 100-150 kg within a LP of 170-200 days and Tushin sheep has an average TMY of 50-60 kg within a LP of 100-140 days (Anonymous, 2003). Dhofari goat estimate of M90 was less than 79.89 kg that found in Indian Jamnapari does (Roy and Mandal, 2010). It is worthwhile mentioned that the studied Dhofari does were practicing the first lactation season after being collected from their original homeland, they were also milked once a day not twice as practiced for other dairy breeds. The present estimate of LP appeared to be more than 162.01 days reported for Indian Jamnapari does (Roy and Mandal, 2010). In Turkish breeds of sheep, Bilgin *et al.* (2010) estimated lactation period in Awassi (31 week), Morkaraman (29 week) and Tushin ewes (27 week). The present estimate of PR appeared to be higher than 60.17% reported for Beetal goats in Pakistan (Waheed and Khan, 2013). Felix *et al.* (1999) indicated a significant effect of breed on persistency.

Tables (1 and 2) indicated a significant (P<0.001) impact of lactation year on TMY, M90 and PR. The first year of lactation was always higher than the second one for TMY (61.29 kg vs. 47.08 kg), M90 (30.27 kg vs. 25.09 kg) and PR (72.71% vs. 60.91%). PR revealed a significant ecotype X lactation year interaction which indicated that ranking of ecotypes is not consistent in both years. The differences in milk yields due to lactation year might reflect the variation in climatic conditions as well as feed and fodder availability. It might also be related to photoperiod since the increase in the hours of light seemed to increase milk production and feed intake. Similar findings were observed in Indian goats (Singh *et al.*, 2009), Indian Jamnapari does

Table (1). Analysis of variance for total milk yield (TMY, kg), 90 days cumulative milk yield (M90, kg), lactation period (LP, days), persistency (PR%) and Wood's lactation curve parameters (a, b and c) in Dhofari goat.

Source	DF	Mean Squares						
		TMY	M90	LP	PR	a	b	c
Total	232							
Ecotype (Eco)	3	124.31	56.92	39.88	310.30	0.54***	0.12	0.001
Lactation year (L)	1	9496.19***	1265.28***	532.02	6548.42***	4.50***	0.15	0.001
Eco X L	3	86.89	43.45	210.79	778.55**	0.19	0.03	0.000
Residual	225	128.90	34.21	585.55	221.05	0.10	0.07	0.001

** : P≤0.01 *** : P≤0.001

Table (2). Least square means ± standard errors for total milk yield (TMY, kg), the 90 days cumulative milk yield (M90, kg), lactation period (LP, days), persistency (PR%) and Wood's lactation curve parameters (a, b and c) in Dhofari goat.

Overall	TMY	M90	LP	PR	A	b	c
mean	51.08±11.4	26.56±5.9	226.10±24.2	64.17±14.9	0.217±0.3	0.83±0.3	-0.14±0.0
Ecotype							
Elwasat	55.86±1.7^{a}	28.97±0.9^{a}	226.32±3.6^{a}	64.85±2.2^{a}	0.262±0.1^{a}	0.79±0.0^{ba}	-0.14±0.0^{ba}
Elsharkiya	55.02±1.7^{a}	27.54±0.9^{a}	227.70±3.7^{a}	69.28±2.2^{a}	0.202±0.1^{b}	0.88±0.0^{a}	-0.14±0.0^{ba}
Elgharbiya	52.08±1.7^{a}	26.28±0.9^{a}	225.78±3.6^{a}	68.75±2.2^{a}	0.230±0.1^{b}	0.77±0.0^{b}	-0.13±0.0^{a}
Najd	53.78±1.6^{a}	27.93±0.8^{a}	227.50±3.3^{a}	64.38±2.0^{a}	0.235±0.0^{b}	0.83±0.0^{ba}	-0.14±0.0^{b}
Lactation Year							
First	61.29±1.4^{a}	30.27±0.7^{a}	228.51±3.0^{a}	72.71±1.8^{a}	0.270±0.0^{a}	0.79±0.0^{a}	-0.13±0.0^{a}
Second	47.08±0.9^{b}	25.09±0.5^{b}	225.14±1.9^{a}	60.91±1.2^{b}	0.198±0.0^{b}	0.85±0.0^{a}	-0.14±0.0^{a}

In the same column, means with different superscripts are significantly different (P<0.05).

(Roy and Mandal, 2010), Awassi ewes (Al-Samarai and Al-Anbari, 2009) and in Chios ewes (Mavrogenis and Papachristoforou, 2000).

Ecotype seemed to have no significant effects on TMY, M90, LP and PR (Tables 1 and 2). However, does of Elwasat ecotype produced more milk in terms of TMY (55.86 kg) and M90 (28.97 kg) while does of Elsharkiya ecotype appeared to be more lactation persistent (69.28%) with longer LP (227.70 days) compared with those of the other ecotypes.

Milk production is largely related to the shape of the lactation curve which describes the lactation potential of the breed. Lactation curve is a graph indicates milk yield and length of time since kidding to understand the pattern of milk production in the prevailing environment. Lactation curves offer summaries of longitudinal milk yield patterns throughout lactation (Ruiz *et al.,* 2000), allowing total milk yield prediction from partial or incomplete data which help milk producers in feeding and reproductive management (Morant and Gnanasakthy, 1989), enable more efficient genetic evaluation and management decisions to find out optimum lactation length, milk production and peak milk yield, ..etc. (Groenewald *et al.,* 1995) and establish a suitable time to end the lactation (Chang *et al.,* 2001). Several mathematical models have been developed to describe lactation curves (Wood, 1967; Morant and Gnanasakthy, 1989; Pollot, 2000). The Wood mathematical model (Wood, 1967) is the most widely used function that allowed adequate description of the shape of lactation curve. Wood proposed an incomplete gamma function in which three constants can be interpreted biologically; a, b and c parameters express initial milk yield (kg), the rate of increase to peak during the ascending phase (kg/week) and the rate of decrease during the descending phase (kg/week), respectively. Moreover, key elements of the lactation pattern are yield peak, which is the maximum milk yield reached during lactation, and lactation persistency (Franci *et al.,* 1999).

Tables (1 and 2) revealed that among Wood's lactation curve parameters (a, b and c), ecotypes and lactation year have only significant effects ($P<0.001$) on "a" which was significantly higher in the first (0.270 kg) than the second year (0.198 kg). Does of Elwasat ecotype had much higher initial milk yield post kidding, being 0.262 kg compared with other ecotypes. Although not significant, Elsharkiya ecotype had a sharper increase up to the peak (b) compared with other ecotypes. All ecotypes revealed almost the same rate of decline in milk yield after the peak (c). For estimating Wood's parameters (a, b and c) for all ecotypes, it was found that R^2 ranged from 68% to 77% in the first year of lactation and from 77% to 82% in the second year of lactation.

In Beetal goats of Pakistan, a, b and c were estimated as 1.2 kg, 0.37 kg/week and 0.12 kg/week, respectively (Waheed and Khan, 2013). Significant breed differences were reported in accordance with a, b and c parameters among Turkish breeds of sheep; Awassi (1.05 kg, 0.40 kg/week and 0.11 kg/week), Morkaraman (0.46 kg, 0.77 kg/week and 0.14 kg/week) and Tushin ewes (0.98 kg, 0.07 kg/week and 0.06 kg/week), respectively (Bilgin *et al.,* 2010).

For all ecotypes, differences between the actual lactation peak and estimated peaks by gamma function appeared to be less variable in the beginning compared with the end of the peak (Table 3). The actual beginning of the peak was slightly different from the corresponding values estimated by gamma function in both lactation years (4.3 weeks vs. 4.0 weeks). However, the actual end of the peak was obviously extended than the corresponding values estimated by gamma function in both lactation years (11.6 weeks vs. 9.6 weeks). Ranking of ecotypes regarding the peak duration were slightly differed between the actual data and that estimated by gamma function for both years. The longest duration of the peak observed for Elgharbiya does was 10 weeks in the first year while that estimated by gamma function was 8 weeks. The longer persistency observed for some ecotypes might indicate the capability of some animals to maintain producing little amount of daily milk for longer time. It is declared that high persistency is associated with a slow rate of decline in yield

following peak of milk yield and low persistency is associated with a rapid rate of decline (Appuhamy *et al.*, 2007).

Milk yield produced at the end of the peak were generally higher than the corresponding values observed at the beginning of the peak in both lactation years (0.41 kg vs. 0.37 kg). On the other hand, peak of milk yield estimated by gamma function was the same at the beginning and end of the peak in the first (0.45 kg) and second years (0.39 kg). The simple correlation between actual and predicted milk yield for beginning and end of the peak was calculated as 0.81. So, milk producing animals according to gamma function could be fairly predicted from their actual values.

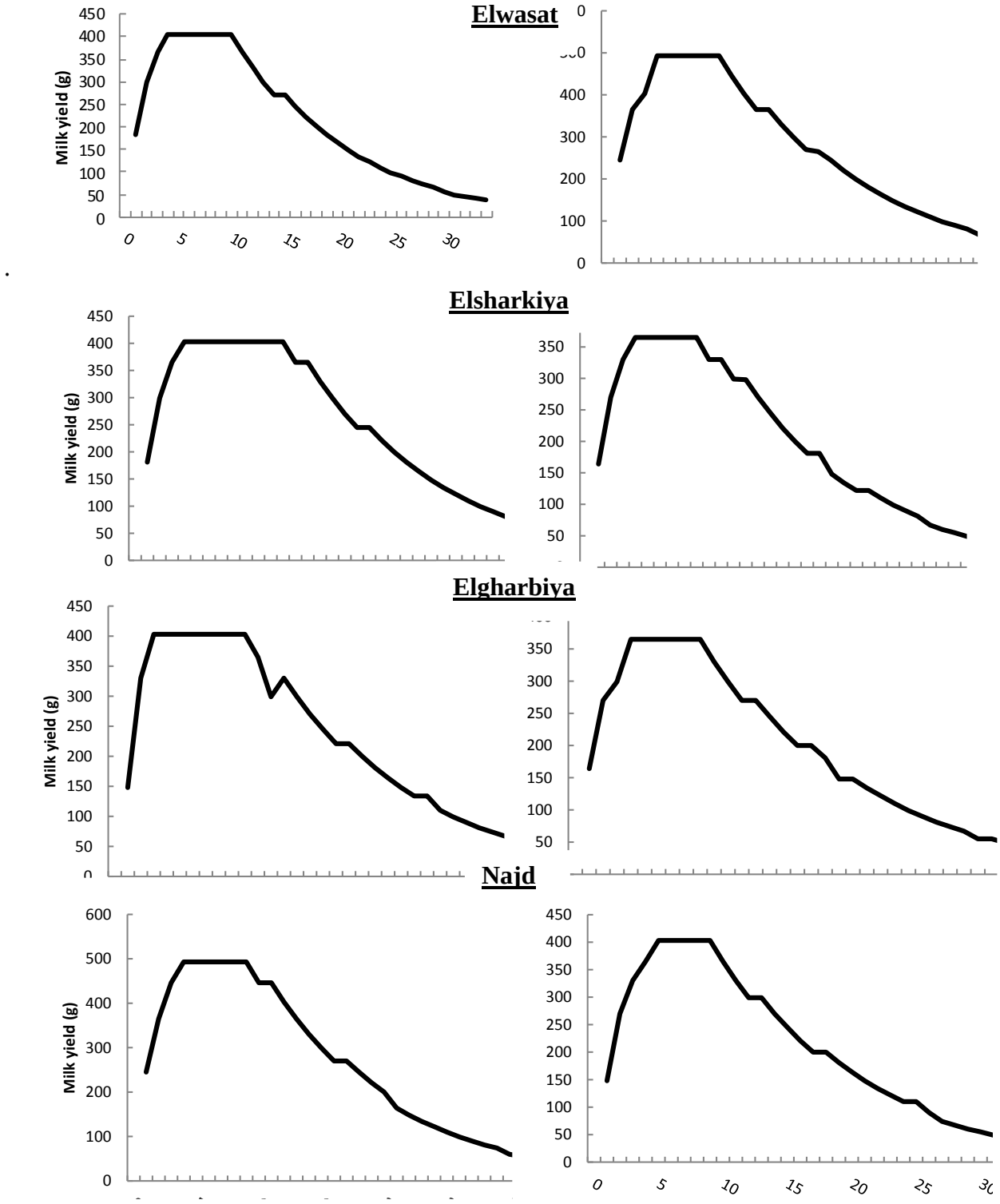
The present results appeared to be less in yield at the peak and longer in time to peak yield compared with Beetal goats of Pakistan (1.3 kg and 3.1 weeks, respectively) as estimated by Waheed and Khan (2013). Comparable with the present study, the peak of milk yield ranged between 0.848 kg/day and 1.175 kg/ day in Mexican goat (Sanchez de la Rosa *et al.*,2006) and 1.4 kg/day at the fourth week in the Sudanese Nubian female goats (Mohammed *et al.*,2007). Significant breed differences in peak yield and time to peak yield were estimated among Turkish breeds of sheep such as Awassi (1.16 kg and 4.9 week), Morkaraman (0.77 kg and 5.7 week) and Tushin ewes (0.82kg and 5.2 week), respectively (Bilgin *et al.*,2010).

In many breeds, an irregular pattern was often observed in the stage of lactation where the total milk yield have been increased periodically to reach the peak of production and subsequently dropped to the end of lactation. The shape of lactation curve is usually explained by the size and sign of lactation curve parameters (Mohammed *et al.*, 2007; Sanchez de la Rosa *et al.*, 2006).

In Dhofari goat, the shape of lactation curves for various ecotypes in both studied years are presented in fig. (1). Slight differences were observed on lactation curves of all ecotypes and lactation years since they appeared to be only significant for "a" (Tables 1 and 2). Generally, lactation curve for Dhofari goat have initial milk production of 0.217 kg, a rate of ascending phase 0.83 kg/week and a decline rate of -0.14 kg/week during the descending phase. Throughout the

Table (3). Weeks to actual yield peak (kg) compared to peak estimated by gamma function for Dhofari goat for different ecotypes and years.

Ecotype	The actual milk yield				After use gamma function			
	Beginning peak		End peak		Beginning peak		End peak	
	Week	Milk (kg)	Week	Milk (kg)	Week	Milk (kg)	Week	Milk (kg)
First lactation year								
Elwasat	5	0.45	10	0.46	4	0.49	9	0.49
Elsharkiya	5	0.42	9	0.42	4	0.40	12	0.40
Elgharbiya	3	0.36	13	0.39	3	0.40	10	0.40
Najd	5	0.42	13	0.44	4	0.49	9	0.49
Mean	4.5	0.41	11.3	0.43	3.8	0.45	10	0.45
Second lactation year								
Elwasat	4	0.37	12	0.45	4	0.40	10	0.40
Elsharkiya	4	0.31	12	0.39	4	0.37	9	0.37
Elgharbiya	4	0.32	12	0.36	4	0.37	9	0.37
Najd	4	0.31	12	0.40	5	0.40	9	0.40
mean	4	0.33	12	0.40	4.3	0.39	9.3	0.39
Overall mean	4.3	0.37	11.6	0.41	4.0	0.42	9.6	0.42



Lactation Year 1 **Latation Year 2**

Fig. (1). Lactation curves for various ecotypes and lactation years in Dhofari goat.

In practice, the ideal lactation curve should have a reasonable high peak and a moderate flat trend afterwards. Because of the economic importance of lactation persistency, more persistent lactation is desirable because it is related to better animal health and reduction of feeding costs (Dekkers *et al.*, 1998; Grossman *et al.*, 1999). In order to improve lactation persistency, deep knowledge are required for several factors affecting this trait, including genetics, hormonal status, seasonal changes, management techniques, nutrition, … etc Generally, in animals with similar peak yields, the greater the lactation persistency, the greater the total milk yield during lactation (Pulina *et al.*, 2007). Genetic improvement of persistency leads to animals with high mammary storage capacity, longer lifetime of secretory cells and high levels of lactogen hormones (Pulina *et al.*, 2007). Chang *et al.* (2001) have investigated the genetic aspects of the shape of lactation curve in sheep by using the model of Wood (1967) through its parameters; a, b and c. The third parameter of Wood's model (c) controls the descending rate of the curve after the lactation peak, i.e. lactation persistency. It is indicated that the shape of lactation curve in sheep can be altered by selection based on the functions of lactation curve parameters. It is indicated that low to moderate heritability (0.15-0.20) of lactation persistency suggests the possibility of selecting for the optimal shape of the lactation curve (Chang *et al.*, 2001; Macciotta *et al.*, 2006).

Heritabilities, genetic and phenotypic correlation coefficients for the studied traits in Dhofari goat are presented in table (4). Heritabilities of TMY (0.08) and M90 (0.05) appeared to be low while reasonably high heritability existed for PR (0.46). PR had high genetic correlations with TMY (0.82) and moderate one with M90 (0.22), the corresponding phenotypic correlations seemed to be moderate (0.26 and 0.23, respectively). Low heritabilities for TMY and M90 might indicate the importance of environmental factors to improve these traits. However, reasonable high heritability for PR together with its associations with TMY and M90 suggesting that selection based on the persistency would lead to effective genetic progress that directly improve this trait as well as indirectly enhance milk production in this breed. On the other hand, genetic (0.60) and phenotypic correlations (0.86) between M90 and TMY were both high and positive, justifying selection on early measures of milk production.

Wood's lactation curve parameters showed low heritability for "a" (0.03) and high heritabilities for "b" (0.58) and "c" (0.56). Correlations between "a" and "b" and between "b" and "c" were genetically positive while phenotypically negative. PR associated genetically positive with "a" and "b" while negative with "c". Selection for parameter "a" may enhance TMY and persistency while deteriorate M90. In Beetal goats, correlation between "a" and "b" parameters was - 0.27, between "a" and "c" was 0.13 while that between "b" and "c" was 0.92 (Waheed and Khan, 2013). Mavrogenis and Papachristoforou (2000)

Table (4). Heritabilities (on diagonal), genetic (above diagonal) and phenotypic (below diagonal) correlation coefficients among total milk yield (TMY, kg), the 90 days cumulative milk yield (M90, kg), persistency (PR%) and Wood lactation curve parameters (a, b and c) in Dhofari goat.

	TMY	M90	PR	a	B	c
TMY	0.08	0.60	0.82	0.45	-0.74	-0.13
M90	0.86	0.05	0.22	-0.85	-0.97	-0.68
PR	0.26	0.23	0.46	1.00	0.49	-0.82
a	0.18	0.20	-0.01	0.03	0.27	-0.01
b	-0.001	-0.005	0.03	-0.60	0.58	0.96
c	0.015	-0.023	0.033	0.28	-0.87	0.56

estimated heritabilities for M90 (0.45 and 0.46) and TMY (0.55 and 0.50) for Chios ewes and Damuscus does, respectively. In Awassi ewes, Pollot and Gootwine (2001) reported heritabilities for TMY (0.11) and PR (0.11). In Awassi sheep, Palasevski *et al.* (2006) found that the heritability estimates for milk yield varied from 0.14 to 0.40. Pollott *et al.* (1998) estimated heritability of 0.25 for M90.

CONCLUSION

The present study was undertaken while flock at the inception phase. This flock has been formed of groups of animals collected from various regions of poor management and brought together to practice their first lactation seasons in different production systems. The obtained data related to many of these animals in this flock are genetically unrelated. While appreciating the breed differences, there is no available data for Dhofari goat to compare with. Differences in most studied milk traits, among the four ecotypes, were statistically not significant and from the biological and economical points of view they are not important. Thus, the present study recommends pooling these ecotypes together as a Dhofari goat breed. However, employing finger print technique could be done to verify or not such recommendation.

Estimates obtained for characteristics of lactation curve together with genetic and phenotypic parameters provide evidence that Dhofari goat possess a high potential for milk production that could response to genetic improvement process. Applying a system of improved management practices would be effective, particularly for milk production traits. It is most likely that permanent and profitable results to enhance milk production performance of this breed could be achieved through focusing on better genetic goals for Dhofari goat and continuous strict selection, particularly for lactation persistency. Further investigation should be followed up to explore the potentiality of that breed after having better genetic structure in order to validate these estimates in future evaluation.

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قدرات إنتاج اللبن ومنحنى الحليب فى المعز الظفارى

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استخدمت فى هذه الدراسة ٢٣٣ معز ظفارى بنات لعدد ٤٠ تيس وذلك فى محطة بحوث الثروة الحيوانية بصلالة سلطنة عمان. خلال فترة تاسيس القطيع، تم تجميع أربعة أنواع بيئية افترضت لتكون ضمن سلالة الظفارى وهى الوسط، الشرقية، الغربية ونجد لتربيتهم فى نفس الظروف بهدف تقييم هذه الأنواع البيئية ومن ثم المعز الظفارى من حيث قدرتها على إنتاج اللبن، تقييم تأثير النوع البيئى وسنة الحليب على بعض صفات إنتاج اللبن، توصيف منحنى اللبن ومعالمه والعوامل المؤثرة عليهما. تم تسجيل بيانات إنتاج اللبن للمعز فى أول موسم حليب لها خلال عامين متتاليتين. اهتمت الدراسة بصفات إنتاج اللبن الكلى، إنتاج اللبن عند ٩٠ يوم، طول فترة الحليب، المثابرة على الحليب، قمة إنتاج اللبن على منحنى الحليب علاوة على معالم منحنى الحليب أ، ب، ج طبقا للنموذج الغير خطى لوود.

تم تقدير متوسط الحد الأدنى للمربعات لإنتاج اللبن الكلى، إنتاج اللبن عند ٩٠ يوم بمقدار 51.08 كجم و 26.56 كجم على التوالى. أوضحت النتائج التأثير عالى المعنوية لسنة الحليب على إنتاج اللبن الكلى، إنتاج اللبن عند ٩٠ يوم، والمثابرة على الحليب. ومن بين معالم منحنى الحليب، فقد كان التاثير المعنوى للنوع البيئى ولسنة الحليب على "أ" فقط. وقد كانت السنة الأولى للحليب أعلى دائما من السنة الثانية فى هذه الصفات. تم توصيف شكل منحنى الحليب للأنواع البيئية المختلفة من المعز الظفارى حيث كانت كمية إنتاج اللبن بعد الولادة 0.217 كجم، كان معدل المرحلة التصاعدية من المنحنى 0.83 كجم/ أسبوع ، ومعدل المرحلة التنازلية من المنحنى 0.14- كجم/ أسبوع وخلال فترة الحليب بطول ٣٢ أسبوع تقريبا (226.10 يوم) كانت بداية قمة إنتاج اللبن 0.37 كجم عند 4.3 أسبوع وكانت نهاية قمة إنتاج اللبن 0.41 كجم عند 11.6أسبوع وبعدها حدث انخفاض تدريجى للمنحنى حتى نهاية فترة الحليب وكان متوسط المثابرة على الحليب 64.17%. تم تقدير المكافئات الوراثية لإنتاج اللبن الكلى، إنتاج اللبن عند ٩٠ يوم، المثابرة على الحليب وكانت 0.08، 0.05، 0.46 على التوالى. تم تقدير الإرتباط الوراثى والمظهرى بين إنتاج اللبن الكلى وإنتاج اللبن عند ٩٠ يوم وكانت 0.60، 0.86 على التوالى. أوضحت الدراسة أن المعز الظفارى له قدرات واعدة لإنتاج اللبن ويستجيب لبرامج التحسين الوراثى، كما أوصت الدراسة بإنتماء كل الأنواع البيئية لسلالة واحدة وهى المعز الظفارى.