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SOME PRODUCTIVE CHARACTERISTICS OF SHAMI CAMELS (*Camelus dromedarius*)

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ABSTRACT

This study was carried out on Shami camels at Dier-Alhajar station in Syria to evaluate the effect of some environmental factors on milk parameters daily milk yield (kg), milk fat%, milk protein%, lactose%, non-fat solids%, and total solids and body weight at birth and at 6 months intervals until 4 year-old (6, 12, 18, 24, 30, 36, 42 and at 48 months of age). A total of 1968 records of milk and 2018 records of body weight were used. Data were analysed using 2 fixed linear models by SAS (2012). The studied milk and bodyweight traits were estimated. All studied milk traits were affected by year of production and parity except lactose% was not affected by year of production. Daily milk yield was affected by the interaction between the year of production and the time of milking. All weight traits were not affected by calf sex, birth year, or their interactions except body weight at birth and weight at 18 months of age which were affected by year of production and calf sex, respectively. This study concluded that year of production and parity might influence some milk traits and also birth year might influence body weight at birth of Shami camel.

Key words: Body weights, camels milk traits, shami camel

Camels have unique characteristics that make them more suitable to raise in arid land than other animals. They are also less prone to environmental damage compared to other animals under the pastoral system (Raziq *et al,* 2010). The camel population in Syria is estimated at 46140 animals (FAO, 2018). The greater part of camels is raised under the pastoral system. There are 2 stations for rearing camels in the countryside Damascus and Hama cities. Camel milk yield varies with management and genetic factors (Kariuji, 1997). Konuspayeva *et al* (2009) reviewed that camel milk components differed depending on geographical region, breed, nutritional condition, seasonal and also physiological condition. Milk production in camel is low in amount but with a large variation, however, improvement is possible by management and selection (Hermas, 2002). Four factors should be considered for selecting dairy camel *viz* general appearance, milk production, body capacity and mammary system (Shareha, 2004). In addition, camels that are producing great quantities of milk and meat are due to good management and selection across generations by breeders. Identifying environmental factors that affect milk yield, milk composition and calves' weight is important for the best management of camel herds. The objective of this study was to evaluate the effect of some environmental factors on daily milk yield, milk composition and calves weight from birth to 48 months of age under Syrian conditions.

Materials and Methods

Camels were kept, under open shades and housed in cement barns during the night and bad weather to protect them from rain time in winter and spring season. Camels were fed on Atriplex Salty or *Solsola* rigida plant growth for 8 hours a day. Barley was given as additional ration by 1.5-2.5 kg for females according to production and 1.5 kg for males (kg/head/day). Also, camels were given a bran and cotton meal when available. Water was provided *ad-lib*. Natural mating was allowed with males from the same station. Males were assigned to female according to reproductive efficiency. Females were mated from November to March so calving expected to take place during the months of February through May. The young camels were weaned at 13-15 months, depends on their weight. Both females and males were allowed to mate when their ages reach between 4-5 years according to their weights.

The data were collected from Dier-Alhajar station for Shami camels in the countryside Damascus. Syria. Milk samples were taken 3 times a day during the lactation period. Immediately after

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milking they were weighed using scale and were analysed using the milk scan apparatus. Daily milk yield (kg) and milk fat, milk protein, lactose, non-fat solids and total solids (%) were recorded. Camels calves were weighed (kg) immediately after birth and at 6 months intervals until 4 years old using a fixed scale in the station. Data covering six and three years from 2002 to 2007 and from 2004 to 2006 included 1968 and 218 records for milk and weight traits, respectively of Shami camels.

Data were statistically analysed using SAS (2012) program according to General Linear Models, GLM that were fitted into two models. Duncan multiple range test was used to detect the differences among means of effects (Duncan, 1955).

Results and Discussion

The least-squares means for daily milk yield, kg, milk fat%, milk protein%, lactose%, non-fat solids% and total solids%, are included in table 1. The daily milk yield (DMY) was close to the values of 3.2, 3.8 and 3.96 kg which were determined by Hermas (2002), Zeleke (2008) and Hadef *et al* (2018), respectively. While DMY was higher than 2.4, 2.0 and 1.02-2.0 which were determined by Bakheit *et al* (2004), Moslah *et al* (2005) and Chimsa *et al* (2014), respectively. But DMY was below the values of 16.6, 13.0 and 9.62 kg determined by Ismail and Al-Mutairi (1990), Hanif Khan (1996) and Musa *et al* (2006). The milk fat% (MF%) was close to Amer *et al* (2005), El-tahir *et al* (2014) and Hadef *et al* (2018), which were 3.38%, 3.63% and 3.72%, respectively. The current MF% was less than those estimated by Riek and Gerken (2006), Park and Haenlein (2006) and Gorakh and Pathak (2010), which were 4.70%, 4.9% and 5.5%, respectively. While MF% was higher than 2.47%, 2.72%, 2.92% which were reported by Zeleke (2008), Ismaili *et al* (2019) and Kaskous (2019). The milk protein% (MP%) was similar to (3.87)%, (3.60)% and (3.37)%, which were estimated by Gorakh and

Table 1. Least square means±standard errors (LSM±SE) and variance analysis of milk traits of Shami camel.

Factors	Least Squares Means±Standard Errors					
	Daily milk yield, kg	**Fat%**	**Protein%**	**Lactose%**	**Non-fat solids%**	**Total solids%**
μ	3.52±0.15	3.75±0.11	3.14±0.08	4.74±0.07	8.90±0.10	12.64±0.17
Year of Production (YP)	**	**	**	**Ns**	**	**
2004	4.41±0.17^{a}	4.68±0.12^{a}	4.28±0.09^{a}	4.88±0.07	10.20±0.12^{a}	14.87±0.19^{a}
2005	3.59±0.07^{a}	3.78±0.05^{b}	3.01±0.03^{b}	4.75±0.03	8.77±0.04^{b}	12.54±0.07^{b}
2006	2.57±0.40^{b}	2.78±0.28^{c}	2.15±0.21^{c}	4.58±0.17	7.72±0.27^{c}	10.50±0.44^{c}
Time of Milking (TM)	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**
Morning	3.52±0.25	3.72±0.18	3.15±0.14	4.76±0.12	8.92±0.18	12.64±0.27
Afternoon	3.35±0.24	3.77±0.17	3.16±0.13	4.69±0.10	8.88±0.17	12.62±0.29
Evening	3.70±0.26	3.76±0.16	3.12±0.15	4.77±0.11	8.89±0.19	12.63±0.28
Parity (PR)	**	**	**	**	**	**
1st	1.53±0.17^{e}	3.89±0.12^{ab}	2.76±0.09^{de}	4.86±0.08^{b}	8.59±0.12^{c}	12.48±0.19b^{c}
2nd	1.32±0.31^{e}	3.46±0.22^{c}	4.05±0.16^{a}	5.33±0.13^{a}	10.40±0.21^{a}	13.86±0.34^{a}
3rd	5.21±0.15^{ab}	3.56±0.10^{bc}	2.81±0.08^{de}	4.85±0.06^{b}	8.68±0.10^{c}	12.22±0.16^{bcd}
4th	3.56±0.17^{c}	3.41±0.12^{c}	2.60±0.09^{e}	4.81±0.07^{b}	8.39±0.12^{c}	11.80±0.19^{d}
5th	5.66±0.18^{a}	3.69±0.13^{bc}	3.03±0.10^{cd}	5.20±0.08^{a}	9.26±0.12^{b}	12.94±0.20^{b}
6th	2.57±0.27^{d}	4.10±0.19^{a}	3.59±0.14^{b}	3.52±0.12^{d}	8.15±0.18^{d}	12.23±0.29^{cd}
7th	4.80±0.22^{b}	4.13±0.16^{a}	3.18±0.12^{c}	4.61±0.10^{c}	8.81±0.15^{c}	12.92±0.24^{b}
YP × TM	**	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**
PR × TM	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**
MSE	3.247	1.2655	0.879	0.605	1.534	3.952
CV%	40.74	33.89	33.39	15.99	14.27	16.03

* : $p<0.05$. ** : $p<0.01$. Ns : insignificant effect. μ : Overall mean. MSE: Mean Square Error.

[abc...]Means in the same column without common letter are different at $p<0.05$. CV% : Coefficient of Variation.

Pathak (2010), El-tahir *et al* (2014) and Hadef *et al* (2018), respectively. While MP% was lower than the estimates of Urazakov and Bainazarov (1974) and Riek and Gerken (2006) which were 4.93% and 4.23%, respectively. The MP% was higher than 2.85%, 2.55% and 2.28% which was determined by Zeleke (2008), Ismaili *et al* (2019) and Kaskous (2019), respectively. The lactose% (Lac%) was similar to estimates of 4.74%, 4.13%, 4.37%, that were determined by El-Tahir *et al* (2014), Hadef *et al* (2018) and Ismaili *et al* (2019), respectively. While Lac% was lower than 5.93% and 5.10% which were determined by Riek and Gerken (2006) and Park and Haenlein (2006), respectively. But Lac% was higher than 2.90% and 3.91% that were determined by Brezovecki *et al* (2015) and Kaskus (2019), respectively. Estimation of non-fat solids% (NFS%) was around 9.09% and 8.84%, that was also found by Amer *et al* (2005) and El-Tahir *et al* (2014), respectively. While NFS% was lower than that 10.95%, 14.31%, 10.44% which were reported by Elamin and Wilcox (1992), Zhang *et al* (2005) and Zeleke (2008), respectively. A total solids% (TS%) estimate was close to 12.48%, which was reported by Amer *et al* (2005). While TS% was higher than 9.99%, which was stated by Hadef *et al* (2018). But TS% was lower than 14.40% and 14.68%, which were reported by Park and Haenlein (2006) and Gorakh and Pathak (2010), respectively. These differences in estimates may be due to dissimilar herd management, rearing systems and genotype.

Estimates of DMY, MF%, MP%, NFS% and TS% were lowered significantly (P<0.01) from 2004 to 2006 while the reduction in Lac% was not significant (P>0.05) as shown in table 1. The effect of year of production (YP) on DMY agrees with Aslam *et al* (2002). The effect of YP on MF% and MP% was compatible and was not for Lac% with Ismaili *et al* (2019). The difference between productive years may be due to differences in management, nutritional and climatic conditions. The parity (PR) effect was significant (P<0.01) on all studied milk traits. Estimating the PR showed an unclear trend in all milk traits (Table 1) which may be due to weight and age differences among females. The effect of PR for DMY was consistent with Zeleke (2008), Sallal *et al* (2010) and Chimsa *et al* (2014) but disagreed with Aslam *et al* (2002). The effect of time of milking (TM) was non-significant (P>0.05) on the studied milk traits, where there are no similar research reviews of camels. The interactions of (YP by TM) and (PR by TM) were non-significant on studied milk traits except for DMY, which was significant (P<0.01). These show that the differences in TM within YP and also TM within PR were homogeneous for most studied milk traits except DMY which was heterogeneous.

The least-square mean weights for birth weight (WtB), weight at 6 months age (Wt6), weight at 1st a year age (Wt12), weight at 1.5th years age (Wt18), weight at 2nd years age (Wt24), weight at 2.5th years age (Wt30), weight at 3rd years age (Wt36), weight at 3.5th years age (Wt42) and weight at 4th years age (Wt48) were estimated in table 2. Estimated WtB was lower than 40.6, 37.3 and 37.45-37.60 kg, which was reported by Bissa *et al* (1998), Sallal *et al* (2010) and Bakheit *et al* (2017), respectively. The estimated WtB for males and females were also lower than those determined by Saoud *et al* (1988), Hermas *et al* (1990) and Bakheit *et al* (2017) which were 36.1 and 35.0; 35.9 and 34.01 and 38.85 and 36.20 kg, respectively. The estimated Wt6 was similar to the estimates of 96.42-123.40 kg, that decided by Bakheit *et al* (2017). But Wt6 was lower than the estimates of 170.6, 150.0 and 150.8 kg which were recorded by Umesh (1996), Bissa *et al* (1998) and Sallal *et al* (2010), respectively. The calves' weight estimate Wt12 was within 159.70-221.04 kg which was reported by Bakheit *et al* (2017). On the other hand, Wt12 was lower than the estimate of 211.02, 247.37 and 295.89 which were reported by Bissa *et al* (1998), Sallal *et al* (2010) and Salehi *et al* (2013), respectively. The calves Wt18 was within the range reported by Bakheit *et al* (2017) which were 208.62-326.26 kg. Also, the calves Wt24 was lower than of estimates of 290.23 and 356.27 kg which were reported by Bissa *et al* (1998) and Salehi *et al* (2013). Estimate of calves Wt30, Wt36, Wt42 and W48 were lower than 328.44, 373.23, 435.13, 486.95 kg, reported by Bissa *et al* (1998).

Table 2 showed that most of the studied weight traits were non-significantly affected by birth year (BY) except WtB. The difference in birth weight may be due to the weights of females. The effect of calves sex (S) on weight was non-significant (P>0.05) in most studied weight traits except Wt18. This difference might be due to the fact that male calves were more nervous for females at Wt18. The effect of S on WtB was similar to the results of Sallal *et al* (2010), while El-bashir *et al* (2012) found significant on WtB. The effect of S on Wt6 was consistent with the results of Sallal *et al* (2010), who determined that there were no significant sex differences Wt6. The effect of S on Wt12 was agreed with Sallal *et al* (2010) and Salehi *et al* (2013), where there was non-significant effect of S on Wt12. The difference between sex was determined as a significant effect on Wt24 according to Salehi

Table 2. Least square means±standard errors (LSM±SE) and variance analysis of weights traits at different ages/ kg of Shami camel.

Factors	Least Squares Means±Standard Errors								
	WtB	Wt6	Wt12	Wt18	Wt24	Wt30	Wt36	Wt42	Wt48
μ	32.39± 0.39	121.97± 4.10	178.53± 6.94	230.72± 9.76	259.76± 9.97	12.53± 309.91	340.18± 13.12	354.48± 8.39	426.31± 13.05
BY	*	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
2002	29.95± 0.66^{b}	120.06± 9.41	187.55± 17.74	208.33± 26.57	241.80± 26.75	29.96± 319.15	361.28± 26.63	361.33± 20.60	435.03± 26.97
2003	32.49± 0.79^{ab}	141.29± 8.16	197.14± 14.17	248.88± 19.15	282.07± 19.65	328.05± 26.42	324.06± 41.84	370.78± 23.78	433.85± 38.74
2004	32.58± 0.84^{ab}	125.98± 7.65	186.36± 12.80	241.25± 17.31	277.63± 17.43	297.00± 25.79	356.80± 25.85	348.47± 17.64	462.17± 24.62
2005	32.69± 0.94^{a}	119.83± 10.32	200.25± 16.92	251.63± 25.57	290.68± 26.75	374.33± 29.96	365.10± 33.21	361.25± 22.56	420.75± 36.94
2006	33.50± 1.20^{a}	119.84± 12.33	161.02± 20.22	251.50± 27.33	253.08± 28.20	274.33± 36.47	325.33± 32.41	340.83± 20.60	404.17± 33.72
2007	33.12± 1.13^{a}	104.83± 11.54	138.88± 18.91	182.71± 25.57	213.29± 25.74	266.46± 34.11	308.50± 30.31	344.21± 17.23	401.88± 28.21
Sex	**NS**	**NS**	**NS**	*	**NS**	**NS**	**NS**	**NS**	**NS**
Male	32.93± 0.51	114.90± 5.37	173.57± 9.36	206.71± 13.54^{b}	240.69± 13.47	291.43± 18.73	324.29± 21.60	350.01± 12.85	425.11± 19.92
Female	31.84± 0.59	129.04± 6.20	183.50± 10.24	255.16± $14..05^{a}$	278.83± 14.71	328.40± 16.65	356.06± 14.90	358.94± 10.78	427.51± 16.87
YP × Sex	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
MSE	26.81	1277.35	3434.12	6274.93	6361.62	7979.85	6301.43	2036.53	5457.10
CV%	16.19	28.77	32.00	33.68	30.41	28.13	22.80	12.63	17.15

WtB: Birth weight, Wt6: Weight at 6 month old, Wt12: Yearling weight, Wt18: Weight at 1.5 years old, Wt24: Weight at 2 years old, Wt30: Weight at 2.5 years old, Wt36: Weight at 3 years old, Wt42: Weight at 3.5 years old, Wt48: Weight at 4 years old. * : $p<0.05$. ** : $p<0.01$. ns: insignificant effect. μ: Overall mean. MSE: Mean Square Error. BY : birth year. Sex : Calf Sex. [abc...]Means in the same column without common letter are different at $p<0.05$.

et al (2013). The interaction effect (BY by S) was insignificant on all studied weights. These confirm that the differences between sex within birth years were homogeneous but according to El-bashir *et al* (2012) a significant effect of sex by age on WtB was seen.

Conclusions

The year of production and parity affected significantly the daily milk yield, milk fat%, milk protein%, lactose%, non-fat solid% and total solids%, hence, improving environmental conditions could maximise the benefits of such investment. Also, the birth year significantly affected birth weight. Male's weights were higher than females at the age of 18 months in the Shami camel.

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