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Evaluation of Productive, Reproductive, Longevity and Lifetime Traits of Camel in Egypt

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ABSTRACT

Data used in the present study were collected from history sheets of milk records (420) of 92 Maghrebi she-camels, number of dams were 55 sired by 15 sire, located at Center of Studies and Development of Camel production. Marsa Matrouh governorate belonging to Animal Production Research Institute (APRI), Ministry of Agriculture and Land Reclamation, Egypt. Data were covered the period from 2003 to 2017 year. Data were analyzed using the General Linear Model (PROC GLM) Procedure of the statistical analysis system (SAS, 2009). The model includes, season, year of calving as fixed effects, age at calving, days open and first milk yield as random effects. The overall unadjusted mean of age at first calving (AFC), days open (DO), calving interval (CI_1), number of services per conception (NS/C_1), total milk yield (TMY_1) lactation period (LP_1), number of lactations (NOL), cull age (CULL), productive life (PL), total lactation length (TLL), lifetime milk yield (LMY), milk yield per day of lactation length (MPLL) and milk yield per day of productive life (MPPL) averaged 62.72 month, 168.30 days, 587.37 days, 2.17 services, 1408.76 kg, 410.15 days, 3.98 parity, 3861.80 days, 1940.63 days, 1389.74 days, 5266.02 kg, 4.08 kg and 3.03 kg, respectively. Age at first calving, total milk yield, days open, number of services per conception, number of lactations, cull age, productive life, lifetime milk yield and milk yield per day of productive life were not affected by season of calving. Except for calving interval, lactation period, total lactation length and milk yield per lactation length were significantly affected by season of calving. In addition, she-camels calving in Autumn and Winter had higher AFC, Spring and Summer are higher DO_1, Autumn and Summer had longest CI_1. Summer and Autumn had higher NS/C_1 and Spring and Winter calving had higher TMY_1 and LP_1. Meanwhile, she-camels calving in Spring and Summer are higher NOL, CULL PL and TLL. Summer and Spring calving had higher LMY, Autumn and Winter calving had higher MPLL and Autumn and Summer calving had higher MPPL. Year of calving had significant effect ($p<0.05$) on AFC, CI_1 and CULL. While, non-significant effect on DO_1, NS/C_1, TMY_1, LP_1, NOL, PL, LMY and MPPL. While, highly significant ($p<0.01$) effect on TLL and MPLL. Age at first calving had non-significant effect on DO_1, NS/C_1, TMY_1, NOL, CULL, PL, TLL, LMY, MPLL and MPPL. While, significant effect ($p<0.05$) on LP_1. While, only highly significant effect ($p<0.0001$) on CI_1. Days open had non-significant effect on AFC, NS/C_1, TMY_1, NOL, CULL, PL, TLL, LMY and MPLL. Also, milk yield increased linearly with the increase of DO. While, LP_1 and CI_1 affected highly significantly by days open and only significant effect ($p<0.05$) on MPPL. First milk yield had highly significant effect ($p<0.01$) on TMY_1, NOL, CULL, PL, TLL and MPPL. While, had non-significant effect on both of LP_1, AFC, DO_1, CI_1 and NS/C_1. While, had significant effect through improving management systems and utilization of controlled breeding programs.

Keywords: Camel, productive, reproductive, longevity, lifetime, environmental effects

INTRODUCTION

Camel has been termed as the goal animal in 21st century. Camel is one of the oldest domestic animals in the world. Camels are well adapted to harsh conditions than other domestic farm animals. Considerably it may be use to combat the growing desertification and to feed millions of people living in the desert lands as milk and beef producers. Also, it capable to produce more milk for longer period compared to other domestic dairy animals Al-Owaimer *et al.*, (2014).

In Egypt under the stress of increasing human population and increasing the demand of milk and beef; one of the ways is improving the environmental and genetical of the national native animals to be the best situation of established herds in one hand and in the other hand consisting new imported animal herds. It is a fact that the Camel dairy farming has not yet been developed in a proper way in Egypt, the camel must gain much attention to bridge the gap of demand of human population in this area.

Nowadays some camels herds desireputed in the desert area in Egypt. In the way of improving these herds; the information on the selective value, longevity and productivity are very important.

In this respect, the present study was contemplated to evaluate the productive and reproductive performance of camel as longevity and lifetime traits during the first lactation in one side and the first five lactations in the other side, under Egyptian conditions. In the same time studying the effect of several environmental factors and its effective role in controlling the dairy camel productive and reproductive programs using the animal model in one camel herd in Egypt.

MATERIALS AND METHODS

The current study was jointly planned by the Departement of Animal Production, Faculty of Agriculture, Mansoura University and the Departement of Camel Research, Animal Production Research Institute (APRI), Agricultural Research Center, Ministry of Agriculture and Land Reclamation, Dokki, Giza, Egypt.

1 - Data and management

The data were collected from camel herd raised at the center of Studies and Development of Camel production. located in the Northwest of Egypt, (500 km from Cairo - 31°18'10.4"N 27°05'45.5"E), Marsa Matrouh governorate, belonging to Animal Production Research Institute (APRI), Agricultural Research Center, Dokki, Giza, Egypt. A total of 420 complete lactation records for 92 Maghrebi she-camels at different lactations (1-5) with a complete lifetime and/or longevity records, were compiled during a period from 2003 to 2017. Animals were classified based on age at first calving into three groups <60, 60 - 70 and >70 months, days open into three groups <100, 100 - 300, >300 days and first milk yield completed into three categories <1300, 1300 - 1500, >1500 kg. All records for camels whose sires and/or dams had unknown identification numbers were discarded to avoid censored records.

2 - Feeding system

Camels were loosely housed in open sheds and were kept under controlled system of feeding and management

practiced in the center of Studies and Development of Camel production. The animals were fed on daily basal diet consisting of 3.5 kg concentrate feed mixture (CFM), 2.5 kg berseem hay (BH) (Trifolium Alexandrinum) and 2.5 kg rice straw (RS) with some of fresh salt (Mediterranean saltbush, Atriplex halimus L. per animal). Ingredients of the CFM used in the feeding was composed of 25% wheat bran, 25% yellow corn, 9% uncorticated cotton seed meal, 20% barely, 15% rice brain, 3% molasses, 2% premix and 1% common salt. Daily allowances were offered in amounts to cover the animal requirements according to their milk production, live body weight and the reproductive status as recommended by APRI. Feeds were offered to animals twice daily at 8 a.m and 5 p.m, while drinking clean fresh water was offered freely all day time.

Table 1. Chemical analysis (on DM basis) of different feed stuffs of the basial diet used in feeding camels.

Nutrient	CFM	BH	RS
DM%	89.44	88.91	88.46
Chemical analysis (%):			
OM	92.43	82.92	82.24
CF	8.85	24.91	35.69
CP	12.24	13.85	2.53
EE	4.64	1.14	1.52
NFE	66.70	43.02	40.50
Ash	7.57	17.08	19.76

CFM: Concentrate feed mixture BH: Berseem hay RS: Rice straw

3 – Breeding system

Natural mating is practiced and bulls were assigned to females at random. Mostly the farm-bred sires were used for breeding but some new sires from the breeding tract were also introduced from time to time to avoid adverse effects of inbreeding. Heifers were served for the first time when reached 48 months of age or 330 kg of weight. She-Camels almost mated 60 days after post parturition. pregnancy was detected by rectal palpation 60 days after the last mating.

4 - Routine milking

All used camels were healthy and had udder quarters free of mastitis. Lactating camels were hand milked for the whole udder twice daily at 08:00 and 20:00 h without calf sucking until being dried off at month 12 of lactation, and recorded daily to the nearest 0.1 kg. Milk yield was measured after born calves were allowed to suckle colostrum from their dams for the first seven days. Calves were penned separately from their dams during the full day and fed alfalfa hay and concentrate ad libitum, then bringing individually to their mothers and allowing them to suckle only the two right teats of the udder, whereas the two left teats were hand milked by an experienced milker. The calves were weaned at sixth month of age.

5 - Parameter used

The studied parameters were related to productive, reproductive, longevity and lifetime camel traits.

6 - Statistical analysis

Data was analyses using the general linear model (PROC GLM) procedure of the Statistical Analysis System (SAS, 2009) was used to analyze the Least-Squares Means (LSM) in each level of fixed effects and Duncan test was performed to obtained significant difference among means with ($P < 0.05$).

RESULTS AND DISCUSSION

I - First lactation traits

Unadjusted means ($\bar{X}$), standard deviations (S.D.) and coefficients of variability for age at first calving, days open, calving interval, number of services per conception, total milk yield and lactation period for the first lactation are presented in Table 2.

Table 2. Unadjusted means ($\bar{X}$), standard deviations (S.D.) and coefficients of variation (C.V%) for first lactation traits.

Traits	$\bar{X}$	S.D	C.V%
Age at first calving (AFC) (month)	62.72	6.70	10.69
Days open (DO_1) (days)	168.30	130.94	77.80
Calving interval (CI_1) ((days)	587.37	140.48	23.92
Number of services per conception (NS/C_1) (services)	2.17	0.94	43.31
Total milk yield (TMY_1) (kg)	1408.76	206.76	14.67
Lactation period (LP_1) (days)	410.15	146.47	35.71

1 - Age at first calving (AFC)

The average age at first calving was presented in Table 2. It was found that the average age at first calving was 62.72 month, it is nearly similar to the values given Keskes *et al.*, (2013b) (62.16±10.44 months). On the other hand, the present mean was higher than those showed by Mayouf *et al.*, (2014) (52.44±7.74 mo). Indeed, it was lower than those indicated by Abd Allah, (2016) (64.2 months).

Autumn and Winter calvings had higher AFC being, (64.87 and 63.66 months, respectively) than those calving during Spring and Summer being, (62.93 and 62.83 months, respectively). Likewise, Bissa, (2002) concluded that month of birth had no significant effect on age at first calving. It is believed that the better performance of Maghrebi she-camels in the present study during Autumn and winter months may be accounted for favorable climate and green berseem, Better climatic conditions, feeding and management are recognized to be the major influencing factors of such seasonal changes. Season of calving had non-significant effect on AFC (Table 3). The present results are in close agreement with Bissa, (2002).

The period wise age at first calving was highest in camels born in 2013 year (66.86 month). While, The camels born in 2010 year (59.82 month) had lowest AFC. These variations may be due to change in nutritional and management practices introduced from year to another. Least square analysis of variance in (Table 3) showed that year of calving had significant ($p<0.05$) effect on age at first calving. Likewise, Almutairi *et al.*, (2010 b).

She-camels had <100 days open had the highest AFC (64.35 months), and the lowest was for she-camels had 100 - 300 days open (62.72 months). These results may be attributed to the differences in average of camels age. The influence of DO on AFC were non-significant as showed in (Table 3).

It is seen from (Table 3) that the higher AFC values were recorded for she-camels had level <1300 kg milk yield (64.13 months), and the lowest was for she-camels had level >1500 kg milk yield (63.22 months). In addition, first milk yield completed had non-significant effect on AFC. These variations could be attributed to the inconsistency of the environment which include temperature and humidity,

plane of nutrition and management practices introduced from time to another.

2 - Days open (DO_1)

The means of days open DO_1 (Table 2), was (168.30±130.94 days). The present mean was lower than those mentioned by Almutairi *et al.,* (2010 b) (318 d) and Abd Allah, (2016) 212.06±105.919 d for intensive system and 279.57±97.883 d for nomadic system. While, the present mean was higher than those showed by Abdel-Aziz *et al.,* (2016 b) 99.00±00.00 (1^{st} - 2^{nd}), 128.80±26.40 (2^{nd} - 3^{rd}) and Al-Fatlawi and Al- Hamedawi, (2017) 94.13±7.01 d for $group_1$ and 97.24±6.78 d for $group_2$.

Results presented in (Table 3) cleared that the longest means for days open were 210.70±12.10 and 209.90±6.49 days in Spring and Summer seasons, respectively. In the other side, the shortest values for the same trait were in Autumn and Winter seasons being, 206.35±11.61 and 200.17±9.67, days, respectively. The least square means of DO_1 were non-significantly influnced by season of calving. Similar observations have been made by Almutairi *et al.,* (2010 b). These variations may be due to change in nutritional factors, temperature during the different seasons of birth and calving conditions.

It transpires from (Table 3) that the longest DO_1 values were found in 2004 year (247.48 days). While, the shortest values were recorded in 2006 year (188.61 days). However, the variation due to year of calving in DO_1 was found to be non-significant. These variations may be due to change in nutritional and management practices introduced from year to another. The present results were in close greement with the results of Almutairi *et al.,* (2010 b).

It appears from (Table 3) that she-camels aged >70 months had the higher DO_1 (200.87 days), and the lower were for she-camels aged 60 - 70 months (217.78 days). The effect of age at calving was non-significant on DO_1. Results obtained indicated that she-camels calved at later age have shortest days open than those calving at an earlier age. These results agreed with Almutairi *et al.,* (2010 b) and Abdel-Aziz *et al.,* (2016 b).

It is seen from (Table 3) that the higher DO_1 values were recorded for she-camels had level >1500 kg milk yield (213.96 kg), and the lowest were for she-camels had <1300 kg milk yield (199.59 kg). In addition, first milk yield completed had non-significant effect on DO_1. Improved reproductive performance will directly lead to increased milk production.

Table 3. Least squares means ($\bar{X}$) and standard errors (S.E) for factors affecting age at first calving (AFC), days open (DO_1), calving interval (CI_1) and number of services per conception (NS/C_1) of Camel for the first lactation.

Variables	No	Traits			
		AFC, mo	DO_1, d	CI_1, d	NS/C_1,services
		$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.
Overall mean	92	62.72±0.70	168.30±13.65	587.37±14.65	2.17 ±0.098
Season of calving		NS	NS	*	NS
Winter	42	63.66±0.72	200.17±9.67	569.75±26.94^{ab}	2.03±0.24
Spring	10	62.93±0.91	210.70±12.10	539.16±35.55^{a}	1.93±0.30
Summer	28	62.83±0.48	209.90±6.49	606.97±18.66^{b}	2.43±0.16
Autumn	12	64.87±0.87	206.35±11.61	689.45±32.30^{b}	2.12±0.29
Year of calving		*	NS	*	NS
2003	12	65.47±0.90^{ab}	222.97±11.98	604.44±32.82^{ab}	2.58 ±0.30
2004	9	64.69±1.05^{de}	247.48±14.05	638.75±38.34^{a}	1.97±0.35
2005	5	64.49±1.18^{a}	206.012±15.80	601.33±45.35^{bcd}	2.22±0.39
2006	8	61.93±1.03^{gh}	188.61±13.72	552.28±38.89^{de}	2.26±0.34
2007	12	63.90±0.83^{efg}	207.46±11.10	562.14±26.63^{bcde}	2.39±0.28
2008	5	60.50±1.31^{h}	214.09±17.45	625.67±46.48^{cde}	1.28±0.44
2009	8	62.88±0.98^{ef}	204.04±13.13	663.85±34.44^{ab}	2.16±0.33
2010	3	59.82±1.65^{h}	190.41±22.04	705.50±60.01^{abc}	2.90±0.55
2011	5	63.94±1.31^{e}	189.77±17.55	669.30±46.56^{abcd}	1.90±0.44
2012	5	62.90±1.27^{cde}	207.09±17.01	630.80±48.78^{ab}	1.69±0.42
2013	3	66.86±1.54^{abc}	198.34±20.55	500.88±67.85^{ab}	2.91±0.51
2014	4	62.65±1.32^{fgh}	198.40±17.56	525.81±53.24^{bcde}	1.90±0.44
2015	2	66.01±1.87^{abcd}	211.39±24.88	724.94±98.56^{bcd}	1.46±0.62
2016	7	64.56±1.13^{bcde}	218.27±15.13	545.14±39.95^{cde}	1.50±0.37
2017	4	62.56±1.46^{de}	197.36±19.43	469.16±57.81^{e}	2.75±0.48
Age		-	NS	**	NS
<60	30	-	201.68±7.74	573.55±21.58^{b}	1.96±0.19
60 - 70	42	-	217.78±7.07	647.84±18.91^{a}	2.08±0.17
>70	20	-	200.87±9.24	582.61±26.29^{b}	2.34±0.23
DO		NS	-	**	NS
<100	49	64.35±0.43	-	507.31±17.07^{c}	2.09±0.14
100 - 300	21	62.72±0.71	-	597.92±25.09^{b}	1.86±0.23
>300	22	63.65±0.81	-	698.76±30.11^{a}	2.43±0.27
FMY		NS	NS	NS	NS
<1300	22	64.13±0.68	199.59±9.05	563.51±24.72	2.07±0.22
1300 - 1500	42	63.38±0.53	206.80±7.15	621.13±20.07	2.15±0.17
>1500	28	63.22±0.58	213.96±7.80	619.37±22.16	2.16±0.19

Means with the same letter are not significantly different

** **Highly significant at (P<0.01)** * **Significant at (P<0.05)** NS **Non-significant**

3 - Calving interval (CI_1)

Table 2 shows that the present means of calving interval CI_1 was (587.37±140.48 days). Consequently, it was higher than those recorded by Ali *et al.,* (2018) (375 days). In addition, the previous mean of CI_1 was slightly higher than those stated by Abdel-Aziz *et al.,* (2016 b) 556.20±70.35 days. On the other hand, the previous mean of CI_1 was lower than those postulated by Dowelmadina *et al.,* (2015) (738 d) and Fazal *et al.,* (2017) 672.80 ± 73.41 d and 723.00 ± 15.86 d for $group_1$ & $group_2$, respectively.

As can be realized from (Table 3), the longest means for CI_1 were 689.45 and 606.97 were in Autumn and Summer seasons, respectively. In the other side, the shortest values for the same trait were in Winter and Spring seasons 569.75 and 539.16 days, respectively. The present results are adequate agreement with the findings of Abd Allah, (2016) who depicted that the calving occurs more in the Autumn season. Variations in calving intervals may be attributed to changes in nutritional factors, temperature during the different seasons of birth. Calving interval was significantly ($p<0.05$) affected by season of calving. Similar results have been observed by Almutairi *et al.,* (2010 b) in Saudi Arabia.

The longest CI_1 values were found in year 2015 being, (724.94 days). While, the shortest values were recorded in year 2017 being, (469.16 days). The least square analysis of variance showed that year of calving had significant ($p<0.05$) influence on calving interval (Table 3). In this connection, Aslam *et al.,* (2002) restricted the same results too. While, non-significant effect recorded by Almutairi *et al.,* (2010 b). The differences in CI from year to another may be due to the annual changes of available feeds and different management practices introduced from year to another specially estrus detection as well as number of animals over the period under consideration.

Table 2 shows that she-camels aged 60 - 70 months had the higher CI_1 (647.84 days), and the lowest was for she-camels aged <60 months (573.55 days). In addition, age at calving showed highly significant effect ($p<0.0001$) on CI_1. Contrary findings have been reflected by Abdel-Aziz *et al.,* (2016 b). These variations could be attributed to the inconsistency of the environment which include temperature and humidity, plane of nutrition and management practices introduced from time to another.

She-camels had >300 days open had the higher CI_1 (698.76 days), and the lowest was for she-camels had <100 days open (507.31 days). The longer days open and calving interval in dairy camels are mostly likely caused by several reasons i.e., camels are seasonal breeder, higher days open can occur during droughts when neither female nor male camels restart sexual activity and eventually may lead to repeated service, conception problems, abortions and long calving interval. The effect of DO on CI_1 were highly significant ($p<0.0001$) as showed in (Table 3).

The higher CI_1 values were recorded for she-camels had level 1300 - 1500 kg milk yield (621.13 kg), and the lowest was for she-camels had <1300 kg milk yield (563.51 kg). Camels are known to show lactation anoestrus resulting into the prolongation of calving intervals (Camels with long calving interval tend to produce more milk than those of short ones). In addition, first milk yield completed had non-significant effect on CI_1 (Table 3).

4 - Number of services per conception (NS/C_1)

Means of number of services per conception NS/C_1 (Table 2), was 2.17±0.94 services. The present mean fall in range with those inferred by Saini *et al.,* (2007) (1 -3 services) and Deen, (2013) (2.33 services) with Jaisalmeri camels. While, it was higher than those illustrated by Al-Fatlawi and Al- Hamedawi, (2017) 1.84 ± 0.12 services for the 1st parity with Iraqi she-camel. But it was lower than those noted by Deen, (2013) (3.83 services) with Kachchi camels.

It is evident from (Table 3) that she-camels calving during Summer and Autumn seasons had higher values of NS/C_1 being, (2.43 and 2.12 services, respectively) than those calving during Winter and Spring seasons being, (2.03 and 1.93 services, respectively). Therefore, season of calving had non-significant effect on NS/C_1. The previous results are aligns well with the findings of Bissa, (2002). The non-significant effect of season of calving on NS/C show that she-camels can calve at any season with no determental effect on their performance traits if they kept under suitable conditions of feeding and management especially during the summer seasons.

As seen from (Table 3), the values of number of services per conception were inconsistent and fluctuated from year to another, the higher NS/C_1 values were found in 2013 year (2.91 services). While, the lower values were recorded in 2008 year (1.28 services). Year of calving had non-significant effect on number of services per conception. In contrast, Bissa, (2002) speculated that year of birth had non-significant effect on NS/C_1.

The differences in number of services per conception from year to another may be due to the annual changes in atmospher conditions, quality of available feeds and different management practices introduced from year to another may be the basis of this results.

She-camels aged >70 months had the higher NS/C_1 (2.43 services), and the lower were for she-camels aged 60 - 70 months (1.86 services). Age at calving had non-significant effect on NS/C_1 (Table 3). This happened due to the reproductive efficiency also decreases with aging. In this connection, Bissa, (2002) indicate the same results too.

It could be noticed that she-camels had >300 days open had the higher NS/C_1 (2.43 services), and the lower were for she-camels had 100 - 300 days open (1.86 services). And the effect of DO on NS/C_1 were non-significant ($p<0.05$ or $p<0.01$) as showed in (Table 3). These results attributed to that highest days open can occur during droughts when neither female nor male camels restart sexual activity and eventually may lead to repeated service, conception problems and abortion.

It is seen from (Table 3) that the higher NS/C_1 values were recorded for she-camels had level >1500 kg milk yield (2.16 services), and the lowest was for she-camels had level >1300 kg milk yield (2.07 services). However, the first milk yield completed had non-significant effect on NS/C_1. These results lead to the conclusion that clear antogonism was found between number of services per conception and milk yield, their assocation influenced by level of productive and management.

5 - Total milk yield (TMY_1)

The obtained mean value of TMY_1 ± S.E was 1408.76±206.76 kg, (Table 2). It was considerably larger than those reviewed by Bakheit *et al.,* (2015) 1204.05 and Fazal *et al.,* (2017) 901.00± 415.05 While, the present mean was lower than that reported by Mostafa, (2008) 1500. It was lower also than Abdel-Aziz *et al.,* (2016 a) 1716.93 and Fazal *et al.,* (2017) 1839.25 for group$_1$.

Results in (Table 4) indicated that TMY_1 of she-camels calving during Spring was (1430.32 kg) and in Winter was (1416.76 kg) to be higher in values than those calving during seasons Summer (1397.58 kg) and Autumn (1380.02 kg). Which are in consonance with those obtained by Abdalla *et al.,* (2015). Therefore, season of calving was non-significantly affected the overall means of TMY_1. These results are in agreement with the findings of Raziq *et al.,* (2008) who restricted that calving season significantly affected milk yield. The variation of milk yield of camels in different seasons of the year due to differences in availability of green fodder and its nutritive value, favorable climatic condition for milk secrection (especially atmospheric temperature and humidity) since an early range of temperature at that time (>20°C), lead to better feed consumption and utilization, accordingly reflected in higher milk productive. during Winter and Spring seasons.

The present results in (Table 4) reveals that the trend values from the highest value for TMY_1 was 1481.58 kg, these values were reached during 2011 year. In the other side, the lowest TMY_1 (1339.03 kg) was noticed during 2015 year. It could be noticed that the values of TMY_1 were inconsistent and fluctuated from year to another. Thus, no doubt that the differences in milk yield from year to another attributed partly to the genetic constitution of the animals maintained during different environmental, nutritional and managerial conditions as well as number of animals over the period under consideration.

The least square analysis of variance revealed that year of calving constituted non-significant source of variation in TMY_1 (Table 4). On the other wise, significant ($p<0.05$) effect of year of calving was reflected by Aslam *et al.,* (2002).

She-camels aged <60 months had the highest TMY_1 (1434.92 kg), and the lowest were for she-camels aged 60 - 70 months (1387.81 kg). Age at calving interpreted non-significant effect ($p<0.01$) on TMY_1 as reported in (Table 4). Also, Abdel-Aziz *et al.,* (2016 a) in Sudan came to the same results. On the other side, Abdalla *et al.,* (2015) opined that age at calving had significant effect on total milk yield.

These variations could be attributed to the inconsistency of the environment which include temperature and humidity, plane of nutrition and management practices introduced from time to another.

Results regarding the effect of days open on TMY_1 were presented in (Table 4). She-camels had >300 days open had the highest TMY_1 (1458.08 kg), and the lowest were for she-camels had <100 days open (1364.54 kg). It could be concluded that she-camels with long **DO** produce more milk than those short ones. Non-significant effect of age at calving on TMY_1 was obtained.

Table 4. Least squares means ($\bar{X}$) and standard errors (S.E) for factors affecting total milk yield (TMY_1) and lactation period (LP_1) of Camel for the first lactation.

Variables	No	Traits	
		TMY_1, kg	LP_1, d
		$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.
Overall mean	92	1408.76±21.56	410.15±15.27
Season of calving		NS	*
Winter	42	1416.76±33.44	438.01±19.10^b
Spring	10	1430.32±41.87	521.75±34.14^a
Summer	28	1397.58±22.47	405.51±28.43^b
Autumn	12	1380.02±40.16	378.48±35.60^b
Year of calving		NS	NS
2003	12	1387.84±41.45	442.88±35.24
2004	9	1358.03±48.60	475.51±41.32
2005	5	1373.94±54.67	460.96±46.48
2006	8	1443.58±47.45	362.98±40.34
2007	12	1408.44±38.40	385.61±32.65
2008	5	1405.32±60.37	451.93±51.32
2009	8	1431.70±45.43	523.77±38.62
2010	3	1473.09±76.25	514.05±64.82
2011	5	1481.58±60.71	511.78±51.62
2012	5	1419.41±58.84	397.45±50.03
2013	3	1356.63±71.09	367.95±60.44
2014	4	1474.87±60.74	370.02±51.64
2015	2	1339.03±86.05	478.69±73.16
2016	7	1358.09±52.35	384.94±44.51
2017	4	1381.00±67.20	410.52±57.13
Age		NS	*
<60	30	1434.92±26.77	422.70±22.76^b
60 - 70	42	1387.81±24.47	477.34±20.80^a
>70	20	1395.78±31.97	407.76±27.18^b
DO		NS	**
<100	49	1364.54±19.88	334.32±16.90^c
100 - 300	21	1395.90±32.86	442.91±27.94^b
>300	22	1458.08±37.61	530.58±31.97^a
FMY		-	NS
<1300	22	-	400.51±26.62
1300 - 1500	42	-	453.29±21.04
>1500	28	-	454.01±22.93

Means with the same letter are not significantly different
** **Highly significant at (P<0.01)** * **Significant at (P<0.05)**
NS **Non-significant**

6 - Lactation period (LP_1)

It could be noticed that the present overall unadjusted mean of lactation period was 410.15±146.47 for LP_1, (Table 2). Consequently, these value was longer than those reported by Mayouf *et al.,* (2014) (342 d) and Abd Alla *et al.,* (2015) (360 d). And it was nearly similar to Ishag *et al.,* (2017) (326.93 d) for semi intensive system and (391.43 d) for intensive system. But, it was shorter than those reported by Eisa and Mustafa, (2011) (445 d).

Table 4 reveals that the longest means for LP_1 were 521.75 and 405.51 days in Spring and Winter seasons, respectively. In the other side, the shortest values were in Summer and Autumn seasons being, 438.01 and 378.48 days, respectively. Also, season of calving was affected LP_1 significantly ($p<0.05$). The previous results are close agreement with Bekele *et al.,* (2002) and Musaad *et al.,* (2013 b). The variation of lactation period of camels in different seasons of the year may be attributed to differences in nutritional factors and atmospheric

temperature and humidity during the different seasons of birth.

It transpires from (Table 4) that the longest values for LP_1 was 523.77 days was reached during 2009 year. In the other side, the shortest LP_1 (362.98 days) was noticed during 2006 year. Year of calving had non-significant source of variation in LP_1. An opposite trend detected by Aslam *et al.,* (2002) stated that Year of calving constituted a significant ($p<0.05$) source of variation in lactation period. These results may be due to many factors such as climatic, nutritional and management practices introduced from time to another.

It was found that she-camels aged 60 - 70 months had the highest LP_1 (477.34 days), and the lowest was for she-camels aged >70 months (407.76 days). Lactation length tended to decrease with the progress of age of she-camels at first calving, she-camels calving at earlier age milked more days than those calved at late age. Age at calving had significant effect ($p<0.05$) on LP_1 (Table 4). Similar trend attained by Bekele, (2010). While, non-significant effect recorded by Abdel-Aziz *et al.,* (2016 a).

She-camels had >300 days open had the highest LP_1 (530.58 days), and the lowest were for she-camels had <300 days open (334.32 days). This is due to high yielding she-camels inseminate later than moderate or low producing she-camels. Days open had highly significant ($p<0.01$) on lactation period (Table 4).

The longest LP_1 values was recorded for she-camels had level >1500 kg milk yield (454.01 days), and the lowest was for she-camels had level <1300 kg milk yield (400.51 days). Selection for first lactation milk yield would lead to increase lactation period. Therefore, the previous results reffered that the effect of first milk yield on LP_1 was non-significant effect (Table 4).

Ⅱ - Longevity and lifetime traits

Unadjusted means ($\bar{X}$), standard deviations (S.D.) and coefficients of variability for number of lactations, cull age, productive life, total lactation length, lifetime total milk yield, milk yield per day of lactation length and milk yield per day of productive life are presented in Table 5.

1 - Number of lactation (NOL)

It is appear from Table 5, that the present mean for number of lactations (NOL) was 3.98±133 parity was to be higher than those reached by Almutairi *et al.,* (2010 a) 2.74 parity for four pure breeds (Malhah, Wadhah, Hamrah and Safrah) and their crosses in Saudi Arabia.

Results in (Table 6) illustrated that she-camels calving during Spring (4.43±0.40 parity) and Summer (4.40±0.33 parity) seasons had higher values of number of lactation (NOL). While, those calving during Winter (3.82±0.22 parity) and Autumn (3.18±0.42 parity) had lower NOL. In addition, season of calving had non-significant effect on NOL. The present results are adequate agreement with the findings of Salem and Hammoud, (2019) with Friesian cattle in Egypt.

It is believed that the better performance of Maghrebi she-camels in the present study during Spring months may be accounted for favorable climate and green berseem, better climatic conditions, feeding and management are recognized to be the major influencing factors of such seasonal changes.

Results presented in (Table 6) cleared that the higher values for NOL was 4.84 parity reached during 2010 year in deciding order. While, the lower NOL (2.28±0.67 parity) was noticed during 2017 year. Statistical the different NOL results were non-significantly influenced by season of calving. Contrary to our findings Salem and Hammoud, (2019) suggested that year of calving had a significant effect on complete lactation number with Friesian cattle in Egypt. These variations may be due to different nutritional and management practices prevalent over different times.

The results regarding the effect of age at calving on NOL was presented in (Table 6). She-camels aged 60 - 70 months had the higher NOL (4.14 parity), and the lower were for she-camels aged >70 months (3.73 parity). Age at calving exists non-significant effect on NOL. Late calving she-camels have fewer lactations during their productive life than early calving she-camels. Salem and Hammoud, (2019) working on Friesian cattle in Egypt came to the same results.

Table 5. Unadjusted means ($\bar{X}$), standard deviations (S.D.) and coefficients of variation (C.V%) for longevity and lifetime traits.

Traits	$\bar{X}$	S.D	C.V%
Number of lactations (NOL) (parity)	3.98	1.33	33.42
Cull age (CULL) (days)	3861.80	930.17	24.09
Productive life (PL) (days)	1940.63	914.25	47.11
Total lactation length (TLL) (days)	1389.74	685.31	49.31
Lifetime total milk yield (LMY) (kg)	5266.04	2257.31	42.87
Milk yield per day of lactation length (MPLL) (kg)	4.08	0.99	24.26
Milk yield per day of productive life (MPPL) (kg)	3.03	1.003	33.10

It is evident from (Table 6) that she-camels had >300 days open had the highest NOL (4.20 parity), and the lowest was for she-camels had <100 days open (3.61 parity) indicated that number of lactations increased linearly with the increase of DO. Indeed, the effect of days open on NOL were non-significant.

The highest NOL was recorded for she-camels had range 1300 - 1500 kg milk yield (4.38 parity), and the lowest was for she-camels had range >1500 kg milk yield (3.25 parity). Therefore, the previous results indicated that the effect of first milk yield on NOL was highly significant effect ($p<0.01$) (Table 6). These results were completely in accordance with Salem *et al.,* (1993) with Friesian cattle in Egypt. But Aly, (1995) cleared non-significant effect of first lactation milk yield on number of lactations completed. The present results indicated that selection for first lactation milk yield would lead to desirable changes in lifetime and longevity traits. Moderate yielding she-camels were more profitable in terms of number of lactation completed than those high yielding she-camels, because it is balanced between production whether milk production or birth of calves.

2 - Cull age (CULL)

The present mean of cull age (CULL) Table 5, was 3861.80±930.17 days, this age was lower than those found by Keskes *et al.,* (2013 a) (4310 d) in Somali, Ethiopia and Abd Allah, (2016) about (8395 – 9490 d in female) and (7665 – 9125 d in male).

It could be noticed from (Table 6) that the cull age of she-camels calving during Spring (4086.72 days) and Summer (3993.99 days) seasons had higher values of CULL. While, the cull age of those calving during Winter (3792.87 days) and Autumn (3176.92 days) had lower CULL. Therefore, the present results indicated that season of calving had non-significant effect on CULL. These variations may be due to management practices prevalent over different times. Contrary observations depicted by Bissa, (2002) observed that the month of birth had highly significant ($p<0.01$) effect on cull age.

The higher values for CULL was observed as 4369.89 during 2007 year in deciding order. While, the lower CULL (2520.40 days) was noticed during 2017 year. From the obtained results of CULL, the effect of year of calving had a significant ($p<0.05$) effect on cull age (Table 6). The same trend opined by Bissa, (2002). These variations may be due to culling strategty practiced prevalent over different times.

The results (Table 6) showed that she-camels aged 60 - 70 months had the higher cull age CULL (4017.12 days), and the lower was for she-camels aged <60 months (3515.94 days). These results revealed that female camels were culled upto their age at first calving increased. Age at calving had non-significant effect on CULL.

Results presented in (Table 6) inferred that she-camels had 100 - 300 months had the longest CULL (3863.80 days), and the shortest was for she-camels had <100 months (3564.40 days). Days open had non-significant on CULL. These results indicated that she-camels with long days open tend to exclude earlier than those with short days open.

It could be noticed from (Table 6) that the longest CULL values were recorded with she-camels had level 1300 - 1500 kg milk yield (4012.38 days), and the shortest was for she-camels had level >1500 kg milk yield (3333.78 days). Therefore, first milk yield completed had a highly significant ($p<0.01$) effect on CULL. The present results are in agreement with with the finding of Salem *et al*., (1993) evidence non-significant effect of first lactation milk yield on culling age. These results concluded that the average culling age increased in low yielding she-camels.

3 - Productive life (PL)

(Table 5), showed that mean value of productive life (PL) was (1940.63±914.25 days), it fall in range as revealed by Farah *et al.,* (2004) (1642.5 – 2555 d). Whereas, it was lower than those stated by several authors, Keskes *et al.,* (2013 b) (2555 – 10950 d) with Somali female camels in Somal and Ali *et al.,* (2018) (7300 d) with camelus dromedarius in Saudi Arabia. This indicated that productive herd life is more in camel due to longer gestation period and seasonality of breeding.

As for the obtained result of productive life PL (Table 6), she-camels calving during Spring need 2102.65 days and Summer 2010.41 days seasons had higher effect values of PL. While, those calving during Winter need 1878.00 days and Autumn 1238.95 days to be lower PL. Indeed, season of calving had non-significant effect on PL. The present results are in line with those of Bissa, (2002). These variations may be due to change in nutritional and environmental temperature during different seasons.

As clarified from Table 6 that the longest life span values for PL was 2464.69 days during 2010 year. While, the shortest PL (595.14 days) was noticed during 2017year. Year of calving had non-significant influence on PL. Opposite trend postulated by Bissa, (2002) concluded that the effect of period of birth on productive herd life was highly significant ($p \leq 0.01$). These variations may be due to change in nutritional and management practices introduced from year to another.

Results from (Table 6) produced that she-camels aged 60 - 70 months had the longest PL (2102.65 days), and the shortest were for she-camels aged <60 months (1878.00 days). Late calving she-camels had longer productive life than early calving she-camels. In addition, age at calving had non-significant effect on PL.

The present results in (Table 6) reveals that she-camels had 100 - 300 days open had the highest PL (2081.43 days), and the lowest were for she-camels had >300 days open (1525.99 days). In addition, the effect of days open on PL was non-significant. It could be concluded that she-camels with long days open had short productive life than those short ones.

The longest PL values were recorded with she-camels had range 1300 - 1500 kg milk yield (2075.45 days), and the lowest was for she-camels had range >1500 kg milk yield (1397.47 days). Therefore, it could be detected from (Table 6) also, that PL affected by first milk yield completed highly significantly ($p<0.01$). The present results indicated that selection for first lactation milk yield would lead to desirable changes in lifetime and longevity traits. Moderate yielding she-camels were more profitable in terms of length of productive life than those high yielding she-camels, because it is balanced between production whether milk production or birth of calves.

4 - Total lactation length (TLL)

Total lactation length has not received the attention it deserves, few studies are available on camel. Estimates of total lactation length (TLL) are presented in (Table 5), the mean value of TLL was (1389.74±685.31 days). The present mean was higher than those noted by Abdel-Aziz *et al.,* (2016 a) from 1^{st} – 3^{rd} parity with Sudanese Arabi camel in Butana, Sudan. Meanwhile, it was lower than those detected by Raziq *et al*., (2010) 1556 days from 1^{st} – 8^{th} parities with Kohi camels in Pakistan.

From (Table 6) it could be detected that total lactation length (TLL) of she-camels calving during Spring (1627.14 days) and Summer (1606.17 days). In the other side, those calving during Winter (1326.00 days) and Autumn was (972.72 days) showed lower TLL. The season of calving had significant ($p<0.05$) effect on TLL. The present results are in agreement with Salem and Hammoud, (2019) revealed that season of calving had no significant effect on TLL. These variations may be due to change in nutritional and environmental temperature during the different seasons.

From the results presented in (Table 6) it could be found that the longest values for TLL was 2118.44 days during 2010 year. While, the shortest TLL (460.62 days)

was noticed during 2017 year. Significantly, the year of calving had highly significant (p<0.01) influence on TLL. Meanwhile, Salem and Hammoud, (2019) inferred that year of calving had significant effect on TLL with Friesian cattle in Egypt. These variations in total lactation length may be due to different nutritional and management practices prevalent over different times.

As seen from (Table 6) she-camels aged 60 - 70 months had the longest TLL (1530.27 days), and the shortest was for she-camels aged <70 months (1184.27 days). It could be concluded that reduction in total lactation length was noticed with the increase of age at first calving, she-camels calving at earlier age milked more days than those calved at late age. Which are in consonance with those obtained by Salem *et al.,* (1993).

The different in the age at calving had non-significant effect on TLL.

Table 6. Least square means ($\bar{X}$) and standard errors (S.E) for factors affecting number of lactations (NOL), cull age (CULL), productive life (PL) and total lactation length (TLL) of Camel.

Variables	No	Traits			
		NOL, d	CULL, d	PL, d	TLL, d
		$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.
Overall mean	92	3.98±0.139	3861.80±96.99	1940.63±95.33	1389.74±71.46
Season of calving		NS	NS	NS	*
Winter	42	3.82±0.22	3792.87±143.61	1878.00±143.75	1326.00±99.09^{ab}
Spring	10	4.43±0.40	4086.72±256.69	2102.65±256.94	1627.14±177.12^{a}
Summer	28	4.40±0.33	3993.99±213.76	2010.41±213.97	1606.17±147.49^{a}
Autumn	12	3.18±0.42	3176.92±267.64	1238.95±267.89	972.72±184.67^{b}
Year of calving		NS	*	NS	**
2003	12	3.86±0.41	4066.47±264.96^{a}	2035.30±265.22	1384.87±182.82^{abc}
2004	9	3.88±0.49	4085.86±310.65^{a}	2078.65±310.95	1589.72±214.35^{a}
2005	5	4.10±0.55	4160.56±349.43^{a}	2149.05±349.77	1571.57±241.11^{abcd}
2006	8	3.60±0.47	3441.97±303.28^{bcd}	1558.91±303.57	932.04±209.36^{cde}
2007	12	4.65±0.38	4369.89±245.45^{ab}	2403.43±245.68	1674.80±169.36^{ab}
2008	5	3.93±0.60	3565.65±385.84^{abc}	1738.48±386.21	1224.37±266.23^{abcd}
2009	8	4.39±0.45	4057.81±290.36^{abc}	2118.54±290.64	1877.06±200.35^{a}
2010	3	4.84±0.76	4295.96±487.33^{abc}	2464.69±487.79	218.44±336.25^{ab}
2011	5	4.72±0.61	4064.54±388.02^{abc}	2089.38±388.39	1871.55±267.73^{a}
2012	5	3.59±0.59	3322.6±376.09^{abc}	1381.71±376.45	1306.58±259.50^{abcd}
2013	3	3.89±0.71	3750.48±454.39^{abc}	1673.13±454.83	999.59±313.53^{bcde}
2014	4	4.04±0.61	3619.71±388.20^{abc}	1692.64±388.57	1264.56±267.86^{abcd}
2015	2	3.61±0.86	3656.08±549.98^{cd}	1651.00±550.51	1376.46±379.49^{de}
2016	7	4.02±0.52	3461.31±334.61^{abc}	1482.50±334.93	1082.89±230.88^{bcde}
2017	4	2.28±0.67	2520.40±429.51^{d}	595.14±429.92	460.62±296.36^{e}
Age		NS	NS	NS	NS
<60	30	4.02±0.26	3515.94±171.13	1878.00±143.75	1434.48±118.08
60 - 70	42	4.14±0.24	4017.12±156.43	2102.65±256.94	1530.27±107.93
>70	20	3.73±0.32	3754.82±204.35	2010.41±213.97	1184.27±141.00
DO		NS	NS	*	NS
<100	49	3.61±0.20	3564.40±127.07	1815.09±171.30^{b}	1244.13±87.67
100 - 300	21	4.07±0.33	3863.80±210.07	2081.43±156.58^{a}	1458.80±144.95
>300	22	4.20±0.37	3859.68±240.39	1525.99±204.54^{a}	1446.10±165.87
FMY		**	**	**	**
<1300	22	4.25±0.31^{a}	3941.71±200.17^{a}	1949.59±200.36^{a}	1388.81±138.11^{a}
1300 - 1500	42	4.38±0.24^{a}	4012.38±158.17^{a}	2075.45±158.32^{a}	1623.62±109.13^{a}
>1500	28	3.25±0.27^{b}	3333.78±172.40^{b}	1397.47±172.57^{b}	1136.60±118.96^{b}

Means with the same letter are not significantly different

** **Highly significant at (P<0.01)** * **Significant at (P<0.05)** NS **Non-significant**

The results showed that she-camels had 100 - 300 days open had the highest TLL (1458.80 days), and the shortest was for she-camels had <100 days open (1244.13 days) without significant effect on TLL. It could be concluded that she-camels with long days open had long total lactation length than those short ones.

Form the obtained results from (Table 6) it could be found that the longest TLL values was recorded by she-camels had range 1300 - 1500 kg milk yield (1623.62 days), and the shortest was for she-camels had range >1500 kg milk yield (1136.60 days). Therefore, first milk yield completed had a highly significant (p<0.01) effect on TLL. Selection for first lactation milk yield would lead to desirable changes in lifetime and longevity traits. Moderate yielding she-camels were more profitable in terms of total lactation length than those high yielding she-camels, because it is balanced between production whether milk production or birth of calves.

5 - Lifetime milk yield (LMY)

Table 5, shows that the mean of lifetime milk yield LMY was (5266.04±2257.31 kg). was higher than those reported by Abdel-Aziz *et al.,* (2016 a) 5144.64±202.86 kg from 1st – 3rd parity with Sudanese Arabi camel in Butana, Sudan. While, Conversely, the present mean was lower than that showed by Raziq *et al.,* (2010) 15543 kg for 1st – 8th parity with Kohi camel in Sudan.

Results in (Table 7) showed that LMY of she-camels calving during seasons Summer (6012.50 kg) and Spring (5438.73 kg) had to be the higher values of lifetime production (LMY). While, those calving during Winter

(4995.75 kg) and Autumn (3795.01 kg) obtained lower LMY. The impacts of season of calving on LMY were non-significant. The present results are similar to those provided by Singh *et al.,* (2011) with Sahiwal cattle and Salem and Hammoud, (2019) with Friesian cattle. These variations may be due to change in nutritional and enviromental temperature during different seasons.

It could be noticed that the higher values for LMY was 7115.67 kg during 2010 year. While, the lower LMY (1581.99 kg) was noticed during 2017 year. Statistically, LMY was non-significantly influenced by year of calving (Table 7). Contrary to our results Salem and Hammoud, (2019) with Friesian cattle in Egypt, reviewed a significant effect of year of calving on LMY. These variations may be due to different nutritional and management practices prevalent over different times.

It appears from (Table 7) that age at calving of she-camels aged category 60 -70 months had the higher LMY (5371.13 kg), and the lower was for she-camels aged in the catagory >70 months (4698.87 kg) with non-significant effect on LMY. The present results are alligns well with Salem and Hammoud, (2019) with Friesian cattle in Egypt. Meanwhile, Teke and Murat, (2013) recorded a significant effect ($p<0.05$ or $p<0.001$) on LMY with Holstein cows in Turkey. It could be noted that younger calving she-camels were more profitable in terms of total lifetime milk than older calving she-camels. In this connection, Salem *et al.,* (1993) came to the same results with Friesian cattle in Egypt.

Table 7. Least squares means ($\bar{X}$) and standard errors (S.E) for factors affecting lifetime milk yield (LMY), milk yield per day of lactation length (MPLL) and milk yield per day of productive life (MPPL) of Camel.

Variables	No	Traits		
		LMY, kg	MPLL, kg	MPPL, kg
		$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.	$\bar{X}$ ± S.E.
Overall mean	92	5260.04±235.38	4.08±0.103	3.03±0.104
Season of calving		NS	*	NS
Winter	42	4995.75±368.92	4.12±0.15^{ab}	3.10±0.16
Spring	10	5438.73±659.41	3.31±0.26^{b}	2.52±0.29
Summer	28	6012.50±549.13	3.75±0.22^{ab}	3.13±0.24
Autumn	12	3795.01±687.52	4.37±0.28^{a}	3.36±0.30
Year of calving		NS	**	NS
2003	12	5342.55±680.65	4.11±0.27^{bcd}	3.01±0.30
2004	9	5619.23±798.02	3.94±0.32^{cd}	3.19±0.35
2005	5	4846.40±897.65	3.13±0.36^{d}	2.66±0.40
2006	8	4532.27±779.09	5.02±0.31^{a}	2.67±0.34
2007	12	6096.55±630.53	3.63±0.25^{bcd}	2.53±0.28
2008	5	4605.91±991.17	3.86±0.40^{bcd}	2.43±0.44
2009	8	6076.84±745.89	3.16±0.30^{cd}	2.77±0.33
2010	3	7115.67±1251.87	3.00±0.51^{cd}	2.70±0.56
2011	5	6748.73±996.77	3.36±0.40^{bcd}	3.19±0.44
2012	5	4909.36±966.13	4.18±0.39^{abcd}	3.86±0.43
2013	3	4395.02±1167.27	4.58±0.47^{ab}	3.38±0.52
2014	4	5043.65±997.24	4.55±0.40^{ab}	3.71±0.44
2015	2	4464.80±1412.83	3.00±0.57^{bcd}	2.82±0.63
2016	7	4528.50±859.57	4.17±0.35^{abc}	2.83±0.38
2017	4	1581.99±1103.36	4.58±0.45^{a}	3.67±0.49
Age		NS	NS	*
<60	30	5111.50±439.62	3.91±0.17	3.25±0.19^{a}
60 - 70	42	5371.13±401.84	3.68±0.16	2.80±0.18^{b}
>70	20	4698.87±514.94	4.06±0.21	3.03±0.23^{ab}
DO		NS	NS	NS
<100	49	4782.50±326.42	4.21±0.13	3.44±0.14
100 - 300	21	5446.50±539.65	3.85±0.22	3.12±0.24
>300	22	4952.49±617.54	3.60±0.25	2.52±0.27
FMY		*	*	**
<1300	22	4741.12±514.20^{b}	3.60±0.21^{b}	2.62±0.23^{b}
1300 - 1500	42	5991.25±406.31^{a}	3.77±0.16^{b}	2.82±0.18^{b}
>1500	28	4449.12±442.88^{b}	4.29±0.18^{a}	3.65±0.19^{a}

Means with the same letter are not significantly different

**** Highly significant at (P<0.01)** *** Significant at (P<0.05)** **NS Non-significant**

It transpires from (Table 7) that She-camels had 100 - 300 days open had the higher LMY (5446.50 kg), and the lower was for she-camels had <100 days open (4782.50 kg). Therefore, the effect of DO on LMY were non-significant. It could be concluded that she-camels with long days open had long total lifetime milk than those short ones.

It is evident from (Table 7) that the higher LMY values were recorded with she-camels in range 1300 - 1500 kg milk yield (5991.25±406.31 kg), and the lower was for

she-camels in range >1500 kg milk yield (4449.12±442.88 kg). The effect of first milk yield completed on LMY was significant ($p<0.05$). In this concern, EL-Awady, (1991) came to the same results. Meanwhile, Aly, (1995) recorded that LMY were highly significantly ($p<0.01$) affected by first lactation milk yield. Selection for first lactation milk yield would lead to desirable changes in lifetime and longevity traits. Moderate yielding she-camels were more profitable in terms of total lifetime milk yield than those high yielding she-camels, because it is balanced between production whether milk production or birth of calves.

6 - Milk yield per day of lactation length (MPLL)

Table 5 indicated that the mean of milk yield per day of lactation length (MPLL) was (4.08±0.99 kg). The current mean was slightly higher than the value given by Effa *et al.,* (2013) being, 2.56±0.2 with crossbred dairy cows in Ethiopia.

It is evident from (Table 7) that the milk yield per day of lactation length (MPLL) were higher in she-camels calving during Autumn (4.37 kg) and Winter (4.12 kg) to be higher MPLL. While, those calving during Summer were (3.75 kg) and Spring (3.31 kg) to be lower MPLL. The impacts of season of calving on MPLL were significant ($P<0.05$) as presented on (Table 9). These variations may be due to change in nutritional and environmental temperature during the different seasons.

Similar results were speculated by Singh, (1992) with Sahiwal cattle in India. An opposite trend arrived by Aly, (1995) with Friesian cattle in Egypt.

As seen from (Table 7) the higher values for MPLL was 5.02 kg reached during year 2006. While, the lower MPLL (3.00 kg) was noticed during 2010 year. Indeed, year of calving exists a highly significant ($p<0.01$) effect on MPLL. Similarly, Aly, (1995) attained that milk yield per day of lactation length of Friesian cattle in Egypt was found to be affected by calving year. Variations in milk yield per day of lactation length from year to another may be attributed to different nutritional and management practices prevalent over different times.

Results from (Table 7) refers that she-camels aged >70 months gave higher MPLL (4.06 kg), and the lower were for she-camels aged 60 - 70 months (3.68 kg), without significant effect on MPLL. These results recommended that she-camels calving at later age produce more milk than those calving at an earlier age. This could be be attributed to the increase in she-camel size and weight by age.

The days open of she-camels had <100 days open had the higher MPLL (4.21 kg), and the lower were for she-camels had >300 days open (3.60 kg). The statistical of these results, (Table 9) indicated that DO affected MPLL non significantly.

As can be realized from (Table 7) the higher MPLL values were recorded with she-camels had >1500 kg milk yield (4.29 kg), and the lower were with she-camels had <1300 kg milk yield (3.60 kg). Indeed, the effect of first milk yield completed on MPLL was significant ($p<0.05$). EL-Awady, (1991) postulated the same results. The present results recorded that MPLL tended to increase as first lactation milk yield increased. Selection on first milk yield would lead to desirable changes in lifetime and longevity traits.

7 - Milk yield per day of productive life (MPPL)

The mean of milk yield per day of productive life (MPPL) (Table 5), was (3.03±6.70 kg). The present mean was lower than that noted by Effa *et al.,* (2013) being, 5.26±0.3 with crossbred dairy cows in Ethiopia. As can be realized from (Table 7) that MPPL of she-camels calving during Autumn (3.36±0.30 kg) and Summer (3.13±0.24 kg) seasons had higher values of MPPL. While, those calving during Winter (3.10±0.16 kg) and Spring (2.52±0.29 kg) had lower MPPL. Season of calving had non-significant effect on MPPL. These variations may be due to better plane of nutrition and pastoral conditions available to the she-camels during later part of their pregnancy. The present results are in conformity with that of Aly, (1995) using lactation records of Friesian cattle in Egypt.

Table 7 transpires that the higher values for MPLL was 3.86 kg during year 2012. While, the lower MPLL (2.43 kg) was noticed during 2008 year. In addition, year of calving had non-significant effect on MPLL.

Age at calving of she-camels aged <60 months had the higher MPPL (3.25 kg), and the lowest were for she-camels aged >70 months (2.80 kg). Also, (Table 7) showed that age at calving had significant effect ($p<0.05$) effect on MPPL. An opposite trend obtained by Aly, (1995) with Friesian cattle in Egypt. These variations may be due to plane of nutrition and or climatic conditions which include temperature and humidity.

It could be noticed that she-camels had <100 days open had the higher MPPL (3.44±0.14 kg), and the lower were for she-camels had >300 days open (2.52±0.27 kg). The effect of DO on MPPL were significant ($p<0.05$) as showed in (Table 7).

It is seen from (Table 7) that the higher MPPL values were recorded with she-camels had >1500 kg milk yield (3.65 kg), and the lower were for she-camels had <60 kg milk yield (2.62 kg). In addition, first milk yield completed had a highly significant ($p<0.01$) effect on MPPL. In the same trend, EL-Awady, (1991) and Aly, (1995) illustrated that MPPL of camel varies greatly depending on first lactation milk yield. The present results concluded that milk yield per day of productive life of camel tended to increase as first lactation milk yield increased. Selection on first lactation milk yield would lead to desirable changes in lifetime and longevity.

CONCLUSION

Under the stress of increasing human population and the demand of milk and beef increased. Therefore, one of the ways to face this problem is improve the native animals genetically and improve the environment related to breeding animals. However, this step needs long time. Therefore, introduced carcass of slaughter animals as well as life animals will be done to face this problem. In the other side, the plan of desire put many animal herds in the desert area consider as good way for improving the desert land. One of the important animal herds in this respect is the camel. The camel is consider as the desert animal for its well adaptation to harsh conditions than other animals. Quite good number of camel herds will be needed for the

desert human population as good producer for beef and milk consumption.

More informations in the productive, reproductive, longevity and lifetime traits were needed in one hand. In the same time evalution of genetic parameters of the camel herds in desert area will be very useful.

As a result of few information of productive and reproductive traits of camel herds, the present study is one of the attempts to evalute the productive, reproductive, longevity and lifetime traits and the relations between these traits to be benefit in increasing the camel herds in the future in Egypt.

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تقييم الصفات الإنتاجية والتناسلية والحياة الإنتاجية للأبل فى مصر

فايق حسنى فراج[1] ، ناظم عبدالرحمن شلبى[1]، طارق حسن مصطفى[2]، عاطف محروس عبدالسلام[2] و شهدان أحمد حسن إسماعيل[2]

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استخدم في هذة الدراسة السجلات الإنتاجية والتناسلية لقطيع الأبل بمركز دراسات وتنمية الأبل بمرسى مطروح التابع لمعهد بحوث الإنتاج الحيوانى - مركزالبحوث الزراعية - وزارة الزراعة في الفترة من 2003- 2017. واشتملت هذه الدراسة على 420 سجل موسم حليب كامل لعدد 92 ناقة مغربية وبلغ وعدد الآمهات المستخدم فى هذة الدراسة 55 أم وعدد الآباء 15 أب . تم تحليل البيانات باستخدام برنامج (PROC GLM - SAS, 2009) وأشتمل النموذج الاحصائى على تأثير كل من موسم وسنة الولادة وترتيب موسم الحليب كعوامل ثابتة، وتأثير العمر عند الولادة وفترة التلقيح المخصب وانتاج اللبن الأول كعوامل متغيرة. بلغ متوسط أقل فرق معنوى لكل من العمر عند أول ولادة، فترة التلقيح المخصب، الفترة ما بين ولادتين وعدد التلقيحات المخصبة اللازمة للآخصاب، إنتاج اللبن الكلى، طول موسم الحليب، عدد مواسم الحليب الكامله، العمر عند الاستبعاد، مدة الحياة الإنتاجية، عدد ايام الحليب مدى الحياة، إنتاج اللبن مدى الحياة، إنتاج اللبن اليومى لكل يوم من إيام الحليب وإنتاج اللبن اليومى لكل يوم من أيام الحياة الإنتاجية 62.72 شهر 168.30 يوم، 587.37 يوم، 2.17 تلقيحه، 1408.76 كجم، 410.15 يوم، 3.98 موسم، 3861.80 يوم، 1940.63 يوم، 1389.74 يوم، 5266.02 كجم، 4.08 كجم و3.03 كجم على الترتيب. لم يكن لموسم الولادة تأثير معنوى على العمر عند أول ولادة، فترة التلقيح المخصب وعدد التلقيحات المخصبة اللازمة للآخصاب ، إنتاج اللبن الكلى، عدد مواسم الحليب الكامله، العمر عند الاستبعاد، مدة الحياة الإنتاجية، إنتاج اللبن مدى الحياة وإنتاج اللبن اليومى لكل يوم من إيام الحياة الإنتاجية، لكن كان هناك تأثيرمعنوى على الفترة ما بين ولادتين، طول موسم الحليب، عدد ايام الحليب مدى الحياة وإنتاج اللبن اليومى لكل يوم من إيام الحليب. لم يكن لسنة الولادة تأثير معنوى على فترة التلقيح المخصب وعدد التلقيحات المخصبة اللازمة لحدوث الحمل، إنتاج اللبن الكلى، طول موسم الحليب، عدد مواسم الحليب الكامله، مدة الحياة الإنتاجية وإنتاج اللبن مدى الحياة وإنتاج اللبن اليومى لكل يوم من إيام الحياة الإنتاجية ولكن كان التأثير معنوى على الفترة ما بين ولادتين والعمر عند أول ولادة، العمر عند الاستبعاد.بينما كان التأثير عالى المعنوية على عدد ايام الحليب مدى الحياة وإنتاج اللبن اليومى لكل يوم من إيام الحليب. لم يكن للعمر عند الولادة تأثير معنوى على فترة التلقيح المخصب وعدد التلقيحات المخصبة اللازمة للآخصاب، إنتاج اللبن الكلى، عدد مواسم الحليب الكامله، العمر عند الاستبعاد، مدة الحياة الإنتاجية، عدد ايام الحليب مدى الحياة، إنتاج اللبن مدى الحياة، إنتاج اللبن اليومى بلكل يوم من إيام الحليب وإنتاج اللبن اليومى لكل يوم من إيام الحياة الإنتاجية، ولكن كان التأثير معنوى على طول موسم الحليب، بينما كان التأثيرعالى المعنوية على الفترة ما بين ولادتين. لم يكن لفترة التلقيح المخصب تأثير معنوى على العمر عند أول ولادة، عدد التلقيحات المخصبة اللازمة للآخصاب، إنتاج اللبن الكلى، عدد مواسم الحليب الكامله، العمر عند الاستبعاد، مدة الحياة الإنتاجية، عدد ايام الحليب مدى الحياة، إنتاج اللبن مدى الحياة، إنتاج اللبن اليومى لكل يوم من إيام الحليب وإنتاج اللبن اليومى لكل يوم من إيام الحياة الإنتاجية ولكن كان التأثيرعالى المعنوية على طول موسم الحليب والفترة ما بين ولادتين. كما لوحظ زيادة إنتاج اللبن بزيادة فترة التلقيح المخصب. لم يكن لإنتاج اللبن الأول تأثير معنوى على كل من العمر عند أول ولادة فترة التلقيح المخصب، الفترة ما بين ولادتين، عدد التلقيحات المخصبة اللازمة للآخصاب وطول موسم الحليب. لكن كان التأثير عالى المعنوية على إنتاج اللبن الكلى، عدد مواسم الحليب الكامله، العمر عند الاستبعاد، مدة الحياة الإنتاجية، عدد إيام الحليب الكلية وإنتاج اللبن اليومى لكل يوم من إيام الحياة الإنتاجية، بينما كان التأثير معنوى على إنتاج اللبن مدى الحياة وإنتاج اللبن اليومى لكل يوم من إيام الحليب.