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EFFECT OF ENVIRONMENT AND MANAGEMENT ON PRODUCTIVE PERFORMANCE AND REPRODUCTIVE IN BUFFALOES.

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ABSTRACT

A total of 1567 normal lactation records extending over 20 years (1985-2004) of Egyptian buffalo cows and the progeny of 131 sires, located at three farms ie. Mehallet Mousa, Sids and Gimmeza, Animal Production Research Institute, Ministry of Agriculture, Egypt, were used in the present study.

Data of total milk yield (TMY), Lactation period (LP), dry period (DP), days open (DO) and calving interval (CI) were analysed according to the effect of sire, farm, season and year of calving, parity and age at first calving (AFC). Data were analysed using Mixed Model Least Squares and Maximum Likelihood Computer Program of Harvey (1990).

The results obtained are as follows:

1. The overall means of total milk yield (TMY), Lactation period (LP), dry period (DP), days open (DO) and calving interval (CI), were 1444 Kg, 223 day, 243 day, 156 day and 465 day, respectively.
2. Farm had highly significant effect on (TMY and LP), while non significant effect on DP, DO and CI.
3. Sire had highly significant effect on the examined productive and reproductive traits.
4. Season and year of calving had highly significant effect on the examined productive and reproductive traits, calving during Winter and Spring season had the highest TMY and LP. While, animals calving during Summer season had the lowest ones when compared to those calving in other season.
5. Parity had highly significant effect on all studied traits. Each of TMY and LP tend to increase as parity progress till the 5th parity and then decreased. While DP, DO and CI tend to decrease with the advance in parity.
6. All partial linear and quadratic regression coefficients of TMY, LP, DP, DO and CI on each of AFC and DO were significant ($P<0.01$), except the linear regression coefficient of DO on AFC it was non significant.
7. The obtained results indicated to the role of the managerial level as well as the appropriate environmental conditions, i.e. (better feeding, better management, reduction of heat stress, better control of disease including vaccination programmes and wide spread milk recording and testing systems) to have great impacts on milk production and reproductive traits of the Egyptian buffaloes raised under the government farms in Egypt.

INTRODUCTION

Since long age Egyptian buffaloes have been raised mainly under farming systems. They are the traditional provider of milk and meat. No doubt it, by an important role as reserve capital for the farm families (Zava, 1995). Therefore, by several ways the farmer tried to maintain the level of milk and meat by improving the management and environment of has own animals. Generally, milk production traits for buffaloes had paramount economic importance on the maintenance of dairy animals (FAO, 1992). Consequently,

Generally, milk production traits for buffaloes had paramount economic importance on the maintenance of dairy animals (FAO, 1992). Consequently, the poor representation important riche in sustaming the factors related to this concept, thus the low productivity of Egyptian buffalo several factors arise, some of which are related to the system of management and the poor environmental conditions under which lactating buffalo are being raised (Badran *et al.*, 2002).

The main objectives of this study are to estimate: the role of some non genetic factors which influence some productive traits i.e. total milk yield (TMY), Lactation period (LP) and dry period (DP), as well as some reproductive traits i.e. days open (DO) and calving interval (CI).

MATERIAL AND METHODS

Normal productive and reproductive records of Egyptian buffaloes were collected from three Experimental Stations belonging to the Animal Production Research Institute, Ministry of Agriculture, to be use in this study. The three farms are Mehallet Mousa in the Northern part of the Delta, Sids in the Upper Egypt and Gimmeza in the Middle of the Delta. Feeding systems managerial and breeding policy of the herds were as reported by Mourad *et al.* (1985); Afifi *et al.* (1992) and Ayyat *et al.* (1997).

A total of 1567 records of all available lactations given by 480 buffaloes and 131 sires produced during a period of 20 years started in 1985 were analysed. The traits investigated included productive traits i.e. total milk yield (TMY), lactation period (LP) and dry period (DP), as well as reproductive traits i.e. days open (DO) and calving interval (CI).

Data were analysed using Mixed Model Least Squares and Maximum Likelihood Computer Program of Harvey (1990). The model used included farm, season of calving, year of calving and parity as fixed effects, age at first calving in month (AFC) and days open (DO) as a covariates sire within farm as random effect, as follows:

$$Y_{ijklm} = \mu + F_i + S_{ij} + M_k + Y_l + P_m + b_1 (X_{1ijklm} \bar{X}_{1ijklm}) + b_2 (X_{1ijklm} - \bar{X}_{1ijklm})^2 + b_3 (X_{2ijklm} - \bar{X}_{2ijklm}) + b_4 (X_{2ijklm} - \bar{X}_{2ijklm})^2 + e_{ijklm}$$

Where Y_{ijklmn} = the individual observation; μ = the overall mean; F_i = the fixed effect of the i^{th} farm; s_{ij} = the random effect of the j^{th} sire within the i^{th} farm; M_k = the fixed effect of the k^{th} season of calving; Y_l = the fixed effect of the l^{th} year of calving; P_m = the fixed effect of the k^{th} parity of calving; b_1 and b_2 = the linear and quadratic regression coefficient, respectively of the different traits studied on age at first calving in months (AFC); X_{1ijklm} = the age at first calving in months for the corresponding Y_{ijklm}; $\bar{X}_{1ijklm}$ = the mean of age at first calving in months; b_3 and b_4 = the linear and quadratic regression coefficient, respectively of milk yield in kg or lactation period in days or dry period in days or days open in days or calving interval in days on age at calving in months; X_{2ijklm} = days open in days for the corresponding Y_{ijklm}; $\bar{X}_{2ijklm}$ = the mean of days open in days; e_{ijklmn} = random element having expectation zero mean and variance σ^2_e.

RESULTS AND DISCUSSION

Means and variation of uncorrected records:

Means, standard deviations (SD) and coefficients of variations (CV%) for productive and reproductive traits of Egyptian buffaloes are presented in table 1.

Means of total milk yield (TMY), lactation period (LP) and dry period (DP) were 1444 kg, 223 day and 243 day respectively. The present results are lower than those reported by Mahdy et al. (1999 and 2001) (1554 kg TMY and 265 day of LP) on Egyptian buffaloes. The estimates results of TMY is lower than the estimate of 2131, 1496, 2286 and 1713kg reported by Pagnacco *et al.* (1992); Tonhati *et al.* (2000) and Rosati and Van Vleck (2002) working on Italian and Brazilian buffaloes, respectively. In the same time higher values were illustrated by Mostageer *et al.* (1981) 1160 kg in 199day and El-Azab (2006) 1245kg in 296 days with Egyptian buffaloes.

Table (1): Mean, standard deviation (SD) and coefficient of variability (CV%) for different traits studied.

Trait	Mean	SD	CV%
TMY, kg	1444	606.9	42
LP, d	223	77.7	34
DP, d	243	111.7	46
DO,d	156	87.6	56
CI, d	466	104.0	22

Means of days open (DO) and calving interval (CI) were 156 and 466 day, respectively, Table (1). The present means were shorter than those obtained by Afifi *et al.* (1992); El-Wardani (1995) and Mahdy *et al.* (2001).

The relatively long DO and CI with lower productivity of buffaloes could be attributed to poor management decisions and to the lack of efficiency in heat detection together with the absence of an effective selection program for reproductive performance. The same conclusion was obtained by Mourad *et al.* 1985 and Mahdy *et al.* 2001. The standard deviations for examined all traits were extremely high, which inflated the values of the coefficient of variations indicating high variability among buffaloes of those herds for all traits under investigations. The differences between our results and those reported by other workers could be due to differences in climate and managerial conditions and/or genetic differences in herds.

Sire:

Sire differences in all lactations productive and reproductive traits (Tables 2 and 3) were highly significant ($P<0.01$). These results are in agreement with those obtained by Ashmawy (1991); Khalil *et al.* (1992); Mahdy *et al.* (1999&2001); Ayyat *et al.* (1997); El-Arian (2001) and El-Azab (2006).

Table (2) Analysis of variance for productive traits in Egyptian buffaloes.

S.O.V.	D.F.	Total milk yield		Lactation period		Dry period	
		M.S.	F	M.S.	F	M.S.	F
Sire	130	486993.1	1.8**	14359.3	2.9**	15395.4	1.6**
Farm	2	1739312.5	6.5**	18694.9	3.8**	27535.5	2.9
Season of calving	3	1664146.4	6.2**	42927.0	8.7**	43238.3	3.6**
Year of calving	19	1096583.7	4.1**	6025.1	1.2	25952.3	2.7**
Parity	4	5983561.8	22.4**	42509.2	8.6**	185124.4	19.5**
Regressions :							
AFC, Linear	1	1204139.4	4.5**	29518.2	60.**	46525.5	4.9**
AFC, Quad	1	1043587.5	3.9**	23614.7	4.8**	38929.5	4.1**
DO, Linear	1	1337932.7	5.0**	20662.7	4.2**	40828.5	4.3**
DO, Quad	1	1123863.5	4.2**	19186.8	3.9**	37030.5	3.9**
Remainder	1404	267586.5		4919.7		9491.9	

* (P<0.05) ** (P<0.01)

Table (3) Analysis of variance for reproductive traits in Egyptian buffaloes.

S.O.V.	D.F.	Days open		Calving interval	
		M.S.	F	M.S.	F
Sire	130	25982.4	1.8**	16054.2	1.96**
Farm	2	29297.9	2.0	15511.3	1.9
Season of calving	3	119128.5	8.1**	75279.2	9.2**
Year of calving	19	30750.9	2.1**	28862.3	3.5**
Parity	4	93763.4	6.4**	64640.4	7.9**
Regressions :					
AFC, Linear	1	52736.2	3.6	48983.2	6.0**
AFC, Quad	1	46876.6	3.2	42452.1	5.2**
DO, Linear	1	-	-	52248.7	6.4**
DO, Quad	1	-	-	39186.5	4.8**
Remainder	1404	14648.9		8163.9	

* (P<0.05) ** (P<0.01)

In this respect, insignificant sire effects on LP, DP and CI in Egyptian and Indian buffaloes were noticed by Afifi *et al.* (1992); Jain and Tailor (1994) and El-Arian (2001). Generally the small value and insignificant sire effect on LP, DP and CI clarified that the genetic improvement of these traits may not be possible through sire selection, but it could be mainly brought about improvement in managerial practices.

Farm:

Farm had highly significant (P<0.01) effects on TMY and LP and non significant effects on DP, DO and CI (Tables 2 and 3). The milk yield in Mehallet Mousa farm was (1510 kg) higher than that (1240 and 1320 Kg) in Seds and El-Gemmaza farms, respectively (Fig. 1).

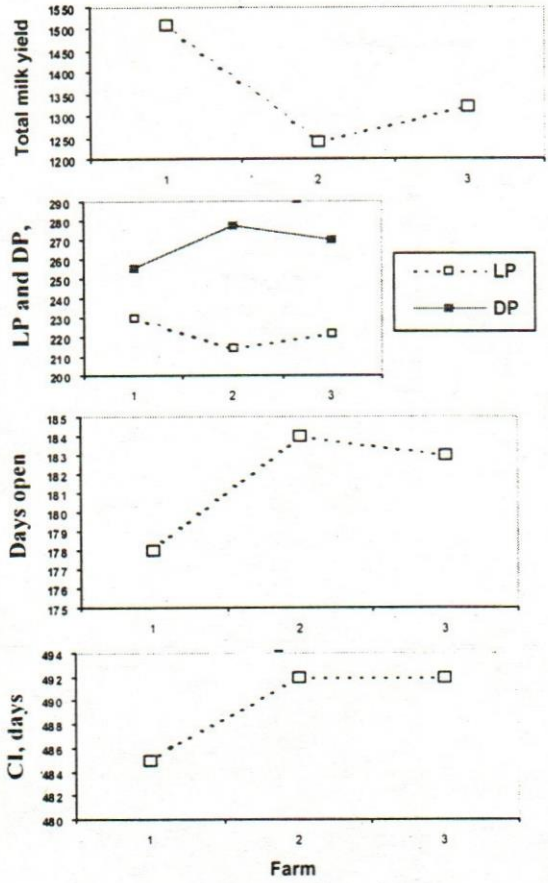

Fig. 1: Effect of farm on milk yield (kg), Lactation period (day), dry period (day), days open (day) and calving interval (day).

Season of calving:

Differences due to season of calving were highly significant (P<0.01) in both productive and reproductive traits (Tables 2 and 3). Buffaloes calving during Winter and Spring seasons had the highest TMY and Longest LP. While, animals calving during Autumn season had the longest DP, DO and CI. In the other side, animals calving during Summer season had the lowest ones when compared to those calving in other seasons (Fig. 2). At Winter and Spring calvers are usually fed remarkable enough green foder in addition at these seasons favorable weather producing high quantities of milk yield. Khalil *et al.* (1992); Mahdy *et al.* (2001) and El-Azab (2006) reached to the same conclusion that seasonal variations in productive performance are due to nutrition and climate conditions.

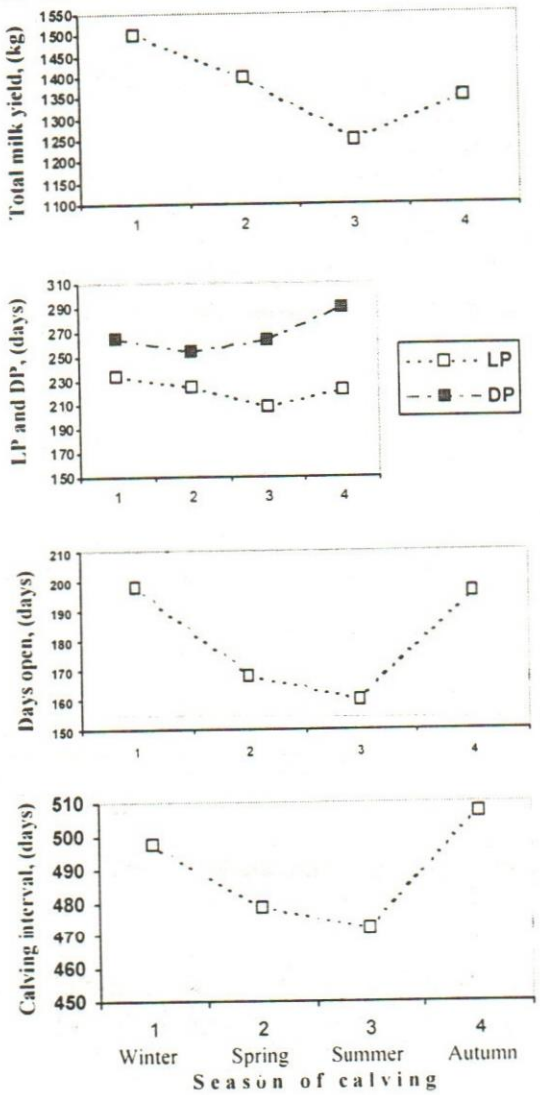

Fig. 2: Effect of season of calving on milk yield (kg), Lactation period (day), dry period (day), days open (day) and calving interval (day).

In the other side, the Spring and Summer calvers had shorter DO and CI than Winter and Autumn calvers (Fig. 2). Similar results were obtained by Ayesh (1992); Ibrahim (1998) and Mahdy *et al.* (2001) they attributed these reproduction traits to higher sexual activity for the animals calving in Summer and Autumn (Ibrahim, 1998). Also, El-Arian (2001) on Murrah buffaloes, found that the season of calving had high significant effects on 305-dMY ($P<0.01$), significant effect (0.05) on DP and insignificant effect on CI.

Year of calving:

Year of calving had highly significant (P<0.01) effects on all studied traits except LP it was non significant (Tables 2 and 3). These results are in agreement with those reported by Ayesh (1992), Afifi *et al.* (1992); Khalil *et al.* (1992); Ibrahim (1998); Mahdy *et al.* (2001) and El-Azab (2006). However, no specific trend was noticed for the significant effect of year of calving on studied each trait (Fig. 3). Although TMY increased from 927kg in the 1985 to nearly 1750 kg in the 2002 year.

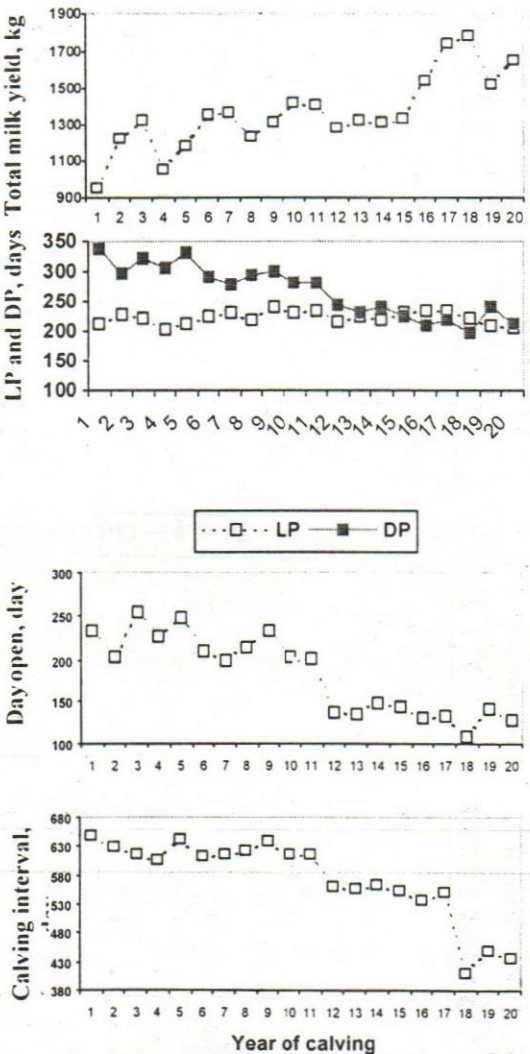

Fig. 3: Effect of year of calving on milk yield (kg), Lactation period (day), dry period (day), days open (day) and calving interval (day).

Parity

It is evident that differences due to parity are highly significant (P<0.01) for both productive and reproductive traits (Tables 2 and 3). Least square means for TMY increased with the advance in parity up to the 5th lactation. The same trend was observed for LP (Fig. 4). This coincides with the increase in cow weight, age, udder development and consequently the increase in fed consumption. These results are in agreement with those obtained by Ashmawy (1991); Khalil *et al.* (1992) and Mahdy *et al.* (2001).

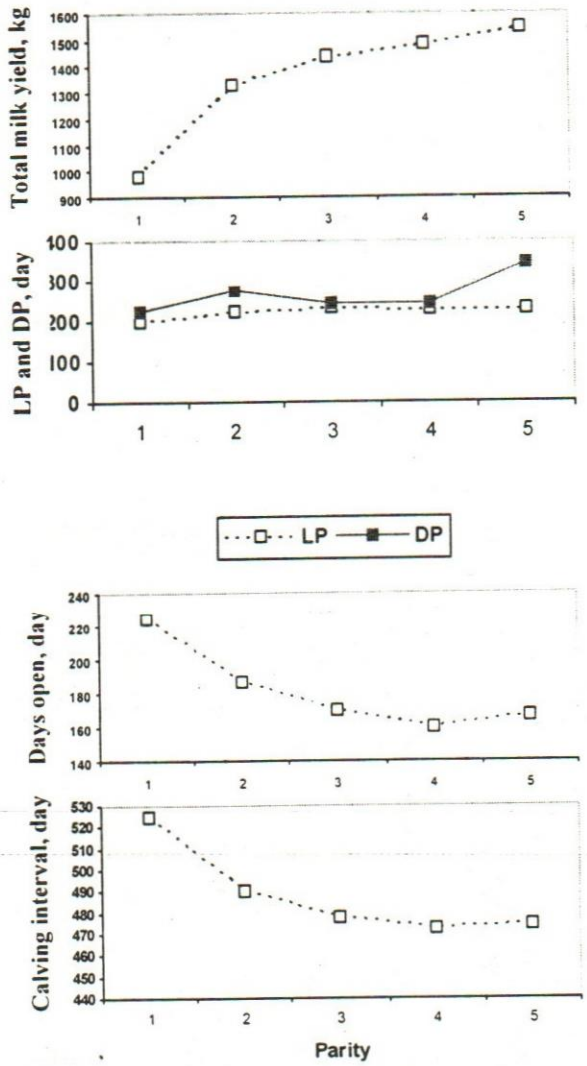

Fig. 4: Effect of parity on milk yield (kg), Lactation period (day), dry period (day), days open (day) and calving interval (day).

Regarding the reproductive traits it showed decrease as parity progress (Fig. 4). Several investigations showed the long days open period to reaching mature body size, poor nutrition, inactive ovaries, silent heat, late access to bull, non ovulatory estrus, infertile services, and inbreeding are the factors lead to lower the reproductive efficiency of buffaloes (Khalil *et al.*, 1992 and Mahdy *et al.*, 2001). In addition, prolonged first lactation CI was found to be due to the insufficient hormonal control of the hypothalamo-pituitary-ovarian axis through the first two parties (Ibrahim , 1998).

Age at first calving and days open:

Estimates of partial linear and quadratic regression coefficient of TMY, LP, DP and CI highly significant (P<0.01) on AFC (Tables 2 and 3) and non significant for DO on AFC. All the estimates of linear regression coefficient were positive except DP but the quadratic regression coefficient were negative for all studied traits.

The results indicated that for each one month increase in AFC, an increase of 9.31 kg in TMY, 1.19 day in LP, 1.69 day in DO and 0.57 day in CI, while decrease of 0.11 day in DP would be expected, (Table 4). These results are in agreement with Rashad (1989) and El-Arian (2001). They reported significant effects of age at first calving on most milk traits. However, the contrary trend was observed by many investigators especially for all lactations (Khalil *et al.*, 1992 and Afifi *et al.*, 1992).

Table (4): Partial linear and quadratic regression coefficients of different traits studied on age at first calving (AFC).

Dependent variable	Partial regression coefficients	
	Linear ± S.E.	Quadratic ± S.E.
TMY, kg	9.31±1.4	-0.15±0.3
LP, d	1.19±1.1	-0.06±0.05
DP, d	-0.11±0.07	-0.05±0.06
DO, d	1.69±1.63	-0.05±0.07
CI, d	0.57±1.37	-0.06±0.05

Quadratic regressions for productive and reproductive traits studied on AFC were negative values (Table 4). In the same direction, including days open (DO) as a linear and quadratic regression coefficients in the model showed highly significant (P<0.01). Positive partial linear regression coefficient for all traits studied on DO (Table 5). The positive association between AFC and TMY may be related to the delayed effect of gestation on reducing milk yield, partioning the available nutrients between milk synthesis and the development of concepts animals with larger days open period El-Arian (2001). The linear regression coefficients values of various traits studied on DO revealed that the increase of DO by one day will yield an increase of TMY by 0.79 kg, LP by 0.15 day, DP by 0.75 day and CI by 0.96 day. The quadratic regression coefficients were negative and highly significant for all studied traits. These coefficients were negative (Tables 2, 3 and 5). In the other side, Khalil *et al.* (1992) and El-Arian (2001) recorded highly positive significant (P<0.01) effects for DO on TMY and LP of Egyptian and Indian buffaloes.

Table (5): Partial linear and quadratic regression coefficients of different traits studied on Days open (DO).

Dependent variable	Partial regression coefficients	
	Linear ± S.E.	Quadratic ± S.E.
TMY, kg	0.79 ± 0.4	-0.001 ± 0.002
LP, d	0.15 ± 0.06	-0.0002± 0.0003
DP, d	0.75 ± 0.06	-0.001 ± 0.0002
CI, d	0.96 ± 0.01	-0.001 ± 0.00003

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تأثير الظروف البيئية والرعاية على الاداء الانتاجى والتناسلى فى الجاموس

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استخدم عدد ١٥٧٦ سجل حليب لمدة ٢٠ عاما ابتداء من ١٩٨٥ وحتى ٢٠٠٤م جمعت من عدد ٤٨٠ جاموس مصرى نقحت من ١٣١ أب من ثلاث محطات وهى محلة موسى وسدس والجميزة والتابعه الى معهد بحوث الانتاج لحيوانى- وزارة الزراعة – الدقى – القاهرة – مصر.

اشتملت الدراسة على الصفات الإنتاجية متمثلة فى إنتاج اللبن الكلى وطول موسم الحليب وفترت الجفاف وكذلك الصفات التناسلية متمثلة فى فترة التلقيح والفترة بين ولادتين.

تم دراسة تأثير كل من الاب والمزرعة وموسم وسنة الولادة وكذلك ترتيب مواسم الحليب وتأثير العمر عند أول ولادة وفترة التلقيح كإنحدار خطى وخط قوسى على جميع الصفات المدروسة . تم تحليل البيانات باستخدام برنامج هارفى (١٩٩٠). وقد لخصت النتائج فى الاتى.:

١- كانت متوسطات انتاج اللبن الكلى وطول موسم الحليب وطول فترة الجفاف وطول فترة التلقيح والفترة بين ولادتين هى ١٤٤٤كجم، ٢٢٣يوم، ٢٤٣ يوم، ١٥٦ يوم، ٤٦٦ يوم على الترتيب.
٢- أظهرت المزرعة تأثيرا معنويا عاليا على كل من انتاج اللبن الكلى وطول موسم الحليب بينما كان التأثير غير معنوى على طول فترة الجفاف وفترة التلقيح والفترة بين ولادتين.
٣- أظهر الطلوقه (الاب) تأثير عالى المعنوية على كل الصفات الانتاجية والصفات التناسلية.
٤- أظهر موسم وسنة الولادة تأثيرا معنويا على جميع الصفات المدروسة حيث كان متوسط الصفات الانتاجية وكل من انتاج اللبن وطول الحليب أعلى فى الشتاء والربيع وأقل فى الخريف والصيف.
٥- تأثير ترتيب موسم الحليب كان عالى المعنوية على كل الصفات تحت الدراسة حيث وجد ان كل من انتاج اللبن الكلى وطول موسم الحليب تميل للزيادة مع زيادة موسم الحليب حتى الموسم الخامس ثم تقل بعد ذلك والعكس من ذلك بالنسبة الى صفا طول فترة الجفاف وفترة التلقيح والفترة بين ولادتين.
٦- كانت معاملات الانحدار الجزئى الخطية (من الدرجة الاولى) لكل الصفات على العمر عند اول ولادة بالشهر وفترة الايام المفتوحة باليوم عالية المعنوية وموجبة عدا صفة طول فترة الجفاف فكانت معنوية وسالبة. بينما كانت معاملات الانحدار التربيعية (القوس خطية) من الدرجة الثانية عالية المعنوية وسالبة لكل الصفات.
٧- نستخلص من هذه الدراسة الاعتناء الجيد بالرعاية للحيوانات وتهيئة الظروف المناخية المناسبة وكذلك توفير العلائق كما وكيفا والمتابعة الدورية والمستمرة للقطعان من حيث الحالة التناسلية والصحية تحت الظروف المصرية.