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Genetic Evaluation for Some Productive and Reproductive Traits in Friesian Cows Raised in Egypt

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ABSTRACT

The objective of this study was to estimate the genetic parameters (heritability, and breeding values) as well as the effect of non-genetic factors such as (abdominal arrangement, season and year of calving also interactions between these factors) for some productive and reproductive traits. From the studied traits: total milk yield (TMY, kg), 305 day milk yield (305d-MY, kg), Lactation period (LP, day) as milk production traits, number of services per conception (NSC, services) and age at first calving (AFC, month) as reproductive traits. A total number of 1876 lactation records of 586 cows (daughters of 374 dams and 58 sires) in Sakha herd, during the period from 2001 to 2015 in dairy Friesian herd in farm Egypt. The analysis was performed using SAS (2003). The model included the random effects of genetic factors (sire effect) and fixed effects (parity, season and year of calving). In addition Single-trait animal models were used to estimate genetic parameters; Animal model was used to estimate heritability and breeding value. 1- Actual means of TMY, 305d-MY, LP, NSC and AFC were 4038.56kg ; 3734.8 kg; 317.8 day; 1.93 and 32.5 month respectively. 2- Heritability (h^2) estimated of TMY, 305d-MY, LP, NSC and AFC were 0.17, 0.25, 0.17, 0.06 and 0.36 respectively. 3- Rank correlation (were computed between predicted breeding values) among TMY, 305d-MY LP, NSC and AFC were highly significant effect, the ranged from -0.17 to 0.59 in production traits. 4- Regression coefficients of estimated breeding values of cow on time were negative and no significant for all studied traits 5- The range of breeding value (BV) for cows was high for most of studied traits. The ranges of breeding values of cows for TMY, 305d-MY, LP, NSC and AFC were 2823, 1744, 2848, 0.754 and 7.68 respectively. In conclusion, The difficulty of genetic improvement of NSC by selection due to the low heritability of this trait but can be improved by increasing good care and improving environmental conditions together. Higher ranges of BV for cows for most of studied traits indicate higher genetic variation and higher opportunity for selection of top cows in breeding value, which would result in rapid genetic progress in the future generations. The study recommends that this be confirmed by molecular genetics to detect the location of quantitative traits that affect milk production and selection of the cows carrying these genes.

Keywords: Productive, reproductive, traits, genetics, heritability, Friesian, Egypt.

INTRODUCTION

Milk production traits of Friesian dairy cattle depends on genetic and environmental factors. Epaphras *et al.,* (2004).

(AFC) has a significant influence on the total cost of raising dairy replacements with older calving heifers being more expensive to raise than younger (Tozer and Heinrichs, 2001). Reducing AFC can also improve the profitability of the enterprise by increasing lifetime milk production (Lin *et al.,* 1988). AFC can be reduced by a combination of increasing prepubertal average daily gain and decreasing age at breeding (Radcliff *et al.,* 2000) or by reducing age at breeding alone (Ettema and Santos, 2004). Estimation of the heritability and breeding values for such milk production traits in dairy cows is necessary for the determination of an optimal breeding strategy (Ahmad *et al.,* 2001 and Javed *et al.,* 2004).

The objective of this study was to estimate phenotypic and genetic parameters of milk production traits in herd cattle raised in Egypt.

MATERIALS AND METHODS

Data source:

The present study used a total number of 1876 lactation records of 586 cows (daughters of 374 dams and 58 sires for nine parity) during a period from 2001 to 2015 in a Friesian herd of Sakha Research Station which belongs to (APRI), Egypt . Analyzed data is shown in Table 1.

Table 1. Analyzed data for Friesian herd raised in Egypt.

Items	Number
Records	1876
Sires	58
Dams	374
Cows	586

Herd management

Animal nutrition depends on concentrate feed mixture along with wheat or rice straw in addition to Egyptian cloves in winter or clover hay during summer. Food was supplied to the cows according to their live weight, milk production and pregnancy status. Free clean water and mineral mixture were available all time. Cow were machine milked twice a day in a parlor at 5 am and at 5 pm. Heifers in farm were served when reaching 18 month of age or 305 kg of live body weight, cows were mated via artificially insemination by using frozen semen from proven sires and pregnancy diagnosis by rectal palpation. The cows were dried off about two months before the next calving. Besides all herd had veterinary consultants for disease management.

Parameter traits studied

The performance traits under study were. (TMY, kg), (305d-MY, kg), (LP, day), (NSC, services) and (AFC, month), the difference (days) between the date of birth and date of first calving.

Statistical analysis:

Data was analyses by using the general linear model (GLM) procedure of (SAS 2003).

The following statistical mixed model was used:

$$Y_{ijklm} = \mu + S_i + P_j + SE_k + YR_l + e_{ijklm}$$

where,

Y_{ijklm} = the individual observation; μ = the overall means; S_i= a random effect of i^{th} sire; P_j= the fixed effect of j^{th} parity of calving; SE_k= the fixed effect of k^{th} season of calving; YR_l= the fixed effect of l^{th} year of calving and e_{ijklm} = the residual effect with $e_{ijklm} \sim N(0, \sigma^2_e)$.

Genetic parameters:

The same previous mentioned data was used to estimate of (heritability, and breeding values) for (TMY), (305d-MY), (LP), (NSC) and (AFC) of Friesian cows in Sakha herds.

(h^2) and BV of studied traits were estimated with derivative-free restricted maximum likelihood (MTDFREML) procedures using the single-trait Animal Model (STAM). According to Boldman *et al.,* (1995) by using Animal Model, The assumed model was:

$$y = Xb + Z_1a + Z_2p + e ,$$

where,

y: a vector of observations, b: a vector of fixed effect, a, p and e are the vectors of direct additive genetic effect, permanent environmental effect and the residual effect, respectively, X, Z_1 and Z_2 are incidence matrix relating individual records to b, a and p.

RESULTS AND DISCUSSION

Actual means, standard deviation (SD) and Coefficients of Variations (CV%) for milk production traits are given in Table (2). The present means of TMY, 305d-MY and LP were 4039 kg, 3735 kg and 318 day, respectively. These results were higher than those found by Mostafa *et al.,* (2013).On the other hand is lower than those reported by Khattab and Atil(1999), Salem *et al.,* (2006) and Ihlam(2012). The average (NSC) was 1.93, similar to Niazi and Aleem(2003), Sattar *et al.* (2005)and Ihlam *et al* (2012). Average of (AFC) for Friesian heifers was 32.49 months this value is similar to findings of Abou-Bakr *et al.,* (2006) for 1172.3 day. While, this is lower than 39.2 that observed by Tadesse *et al.,* (2010). On the other hand the present value is higher than 27.8 and 25. 7 months published by Salem(1998), Afifi *et al.,* (2004) and Ihlam *et al* (2012). The present means of milk production traits are reasonable if the differences in genotypes, climate conditions, management practices and feeding conditions are taken in account.

Table 2.shows the large CV% values for studied milk traits. The values of coefficients of variation (CV %) for TMY and 305d MY in the present study are lower than those reported by Amr (2013) and Sanad and Afifi (2016)and higher than those recorded by Abou-Bakr *et al .* (2006). These values reflects a great variation between individuals in such an important traits.

Least square means (LSM) and standard errors (S.E) for factors affecting TMY, 305d-MY, LP, NSC and AFC are shown in table (3).

Results shown in table.3 revealed that milk production in general did not show no clear trend for the effect of year of calving.

Table 2. Actual means, standard deviations (SD) and coefficients of variation (CV %) for milk production traits in Friesian cows.

Traits	No.	Means	SD	CV %
T MY (kg)	1876	4039	1572.7	38.9
305d-MY (kg)	1876	3735	1168.6	31.3
LP (day)	1876	318	115.5	36.4
NSC (services)	1876	1.93	0.65	33.4
AFC (month)	1876	32.49	4.28	13.2

Table (3) display the effects of parity, season and year of calving on TMY, 305d-MY LP, NSC and AFC. Mean of TMY for autumn and spring had longer than compared summery (table 3) this results agreement Usman *et al* (2011) and Abdel-Gader *et al.,* (2007). Averages of 305d-MY were higher for cows calved in winter and autumn than in spring and summer. This finding points to the importance of green fodder season in improving milk productivity.

The LP tended to increase with advancement of parity up to the 2nd lactation period then declined thereafter. While, LP was longer in spring and summer compared with winter and autumn.

Table 3. Least square means (LSM) and standard error (SE) for factors affecting milk production traits in Friesian cows raised in Egypt.

Independent variable	NNO	TMY Mean ± SE,kg	305d-MY Mean ± SE,kg	L P±SE Mean ± SE,d	NSC±SE Mean ± SE	AFC±SE Mean ± SE,mo
		Parity				
1	449	3894.2±123.1	3894.2±91.1	317.2±9.0	1.97±0.05	33.1±0.31
2	320	4126.8±132.9	3863.4±98.4	342.4±9.8	1.87±0.05	33.1±0.34
3	317	4013.8±128.5	3850.7±95.0	323.3±9.4	1.88±0.05	33.3±0.33
4	217	3925.0±150.2	3629.0±111.1	315.6±11.0	1.73±0.06	32.9±0.39
5	150	4014.9±166.7	3713.1±123.4	330.1±12.2	1.71 ±0.06	32.6±0.43
6	203	4120.6±159.1	3760.9±117.7	320.9±11.7	1.78 ±0.06	32.9±0.40
7	114	4123.1±187.4	3923.7±138.7	333.9±13.8	1.61 ±0.06	32.9±0.48
8	58	4185.4±244.5	3552.4±180.9	332.1±17.9	1.87 ±0.01	34.8±0.63
9	48	4120.3±263.0	3627.5±194.6	326.7±19.3	1.7 ±0.01	34.4±0.67
		Season of calving				
Autumn	570	4090.1±153.6	3738.3±113.7	326.0±11.3	1.7±0.06	33.4±0.39
Winter	516	4022.1 ±146.7	3873.1±108.6	313.6±10.7	1.91±0.06	32.9±0.38
Spring	428	4295.8±212.6	3730.3±157.3	332.4±15.6	1.79±0.08	33.3±0.55
Summer	362	3872.6±165.8	3687.1±122.7	335.6±12.17	1.75±0.06	33.74±0.42
		Year of calving				
2001	149	3618.3±163.5	3325.5±121.0	277.3±12.02	1.80±0.07	34.21±0.42
2002	129	3877.5±172.2	3494.9±127.4	280.2±12.6	1.81±0.07	33.3±0.44
2003	137	4261.6±168.8	3797.3±124.9	304.1±12.4	1.8±0.07	33.9±0.4
2004	190	4298.1±144.7	3774.8±107.0	299.1±10.6	1.8±0.06	33.9±0.37
2005	220	4020.8±147.0	3726.3±108.9	315.9±10.8	1.9±0.06	34.13±0.37
2006	223	3775.5±142.2	3447.3±105.2	325.9±10.4	1.8±0.05	32.6±0.37
2007	195	3829.7±155.1	3550.9±114.8	324.8±11.4	1.7±0.06	32.3±0.40
2008	229	3884.6±142.1	385.2±105.2	322.9±10.4	1.73±0.06	32.8±0.37
2009	231	3377.9±145.7	3326.8±107.8	278.6±10.7	1.86±0.06	33.5±0.37
2010	16	4597.6±434.4	4077.8±321.4	381.3±31.9	1.48±0.17	33.65±1.12
2011	22	4396.8±484.8	4049.3±258.7	373.0±35.6	1.94±0.20	32.18±1.25
2012	30	4135.9±315.3	3869.3±233.3	346.7±23.14	1.61±0.13	32.8±0.81
2013	36	3605.4±300.7	3524.6±222.5	321.3±22.07	1.76±0.12	33.1±0.78
2014	35	3±919.9±468.6	4094.6±346.8	328.2±34.4	1.80±0.19	33.7±1.21
2015	34	5452.9±358.6	4613.3±265.4	424.0±26.3	1.70±0.14	33.9±0.9

These results agree with the finding of Sanad and Afifi (2016) reported that, year of calving had significant effect on TMY and LP for Friesian cow. The year of calving showed that no clear trend observed in the mean of milk traits over the year study (table, 3). These results are in agreement with Sanad *et al.* (2013). The difference from year to year of calving may be due to the variation in management practices and change in herd size from year to another.

Table 4. Combined Least Squares Analysis of Variance for different factors affecting milk production traits in Friesian cows .

Source of variation	DF	Mean Squares				
		TMY	305d-MY	LP	NSC	AFG
Sire	57	3259339.2*	2556260.3***	17389.1*	0.57720698*	94.1***
Parity	8	1007230.0$^{n.s}$	2186598.2*	18232.2$^{n.s}$	2.07713258***	32.1*
Season of calving	3	2469339$^{n.s}$	878196.2$^{n.s}$	11975.7$^{n.s}$	0.90186777*	15.7$^{n.s}$
Year of calving	14	1153956.9***	4045564.4$^{n.s}$	59013.2***	0.48110503$^{n.s}$	38.2**
parity* Season	24	2774065.2$^{n.s}$	958132.6$^{n.s}$	14396.7$^{n.s}$	0.321086$^{n.s}$	19.5$^{n.s}$
season* Year	42	2606354.8$^{n.s}$	1627003.5$^{n.s}$	10476.1$^{n.s}$	0.38185632$^{n.s}$	13.1$^{n.s}$
Residual	1727	2333293	1277444	12567.8	0.3994815	15.56

*** = significant at P<0.05, ** = significant at P< 0.01, *** = significant at P< 0.001, ns = non significant**

The effect of sire had highly significant (P<0.01) effect on TMY, 305d-MY, LP, NSC and AFC and significant effect on TMY, LP and NSC(P <0.05) (table 4). The results lead to important effective role of sire in improving milk production traits. Similar results were obtained by Amr (2013) and Sanad (2016).

Parity had highly significant effect on NSC Table.4 (P <0.001) and significant effect on 305d-MY and AFC (P < 0.01) but not significant effect on TMY and LP. Gabr (2005) suggested that the differences in TMY and 305d-MY among parities were highly significant. Parity had non-significant effect on TMY Also reported by Amasaib *et al.* (2008) for Friesian while significant effect was stated by Ihlam *et al* (2012) and Khair *et al.,* (2007) that reported a significant effect on TMY. Attaral (2009*)* and Allam (2011) obtained that parity had a highly significant effect on LP. Sanad and Afifi (2016*)* had a highly significant effect on TMY, 305d-MY and LP in Friesian cattle raised in Egypt. Hussein (2000) using Friesian cows, found no significant effect of parity on 305d-MY and LP, Also, Gabr (2005) recorded no significant effect of parity on LP.

Season of calving had not significant effect on all milk production traits study (P< 0.05) except that for NSC was significant (P < 0.01) as shown in table (4). Gabr (2005) found that season of calving had highly significant effect on TMY and LP, while no significant effect on 305 day milk yield.

Effect year of calving as reported not was significant affected on 305d-MY and NSC, table. 4 Similar results were obtained by Alattar (2009) and Allam (2011).In this study. Interaction between (parity & season) and the interaction between (season and parity) were not significant on all traits in table. 4. These results were disagreed with those obtained by Abosaq *et al.,* (2016) and Amr *(2013)* reported that had a highly significant effect on milk production. The differences between results could to the management practices, age of the cows, environmental conditions, and different herd size among farms.

Estimates of heritability (h2) for productive and reproductive traits of dairy Friesian cattle are shown in table (5). Medium heritability estimates were recorded for TMY (0.17 ± 0.0001) and 305-DMY (0.25 ± 0.001) and Very low heritability estimates was recorded for NSC (0.06±0.021), while heritability estimates was high for AFC (0.36±0.0001) (Table 5).The lower estimates of h2 NSC concluded that environmental variation contributed the major part of the total variation for the reproductive traits, thus management may be an effective factor in improving such traits.

Table 5. Habitability (h^2), (C^2),, and error (e^2) for milk production traits in Friesian cows.

Traits	h^2±SE	C^2±SE	e ± SE
TMY	0.17±0.0001	0.009±0.001	0.82±0.0001
305d-MY	0.25±0.001	0.00012±0.0001	0.74±0.0001
LP	0.17±0.0001	0.0049±0.0001	0.83±0.0001
NSC	0.06±0.021	0.0004±0.029	0.94±0.034
AFC	0.36±0.0001	0.000012±0.0001	0.64±0.00001

h^2= heritability , C^2 = Direct permanent environmental variance effect and e =residual variance.

In general the estimates of h2 for productive traits in this study were moderate, so any effort to improve these traits by selection within the herd would be ineffective and the most useful way of improving these traits would be by improving management level. El-Arian *et al.,* (2002 observed that h2 estimates for MY, LP, were 0.32 and 0.07, respectively .Similar result was reported by Sanad (2016); Hammoud (2013); Awed and Afifi (2003).

Direct permanent environmental estimates of 0.009, 0.00012, 0.0049, 0.0004 and 0.000012 were obtained for TMY, 305d-MY, LP, NSC and AFC, respectively. These estimates were lower than those reported by Khattab *et al*., (2005). These authors obtained that C2 estimates for 305d-MY and AFC were 0.06 and 0.11, respectively. Joao *et al.* (2015) working on dairy Gyr cattle showed that C2 estimates for 305d-MY was 0.19.

Estimation Pearson correlation was computed between predicted BV. Phenotypic correlation among the studied traits are present in (Table 6).

Table 6. Pearson correlation was computed between predicted breeding values (below diagonal) and phenotypic correlation between milk traits (above diagonal).

Traits	TMY	305d	LP	NSC	AFC
TMY		0.43***	0.59***	-0.02***	-0.02***
305d-MY	0.534***		0. 52***	-0.12***	-0.17***
LP	0.526***	0.399***		0.01	-0.07
NSC	0.059*	0.049*	-0.005		0.15***
AFC	-0.012	-0.041	-0.023	0.0196	

The results in Table 6 .Pearson correlations were noted among the breeding values for TMY, 305d-MY, LP, NSC and AFC were positive and highly significant (P< 0.001) among except TMY,NSC,305-dMY and AFC were negative and highly significant. The pearson correlation (rg) between TMY,305d-MY and LP positive, while (rg) between the productive traits and reproductive traits (NSC and AFC) was negative (rg) ranged from (-0.17 to 0.59), while Phenotypic correlation (rp) were (-0.041 to 0.53) in table 6 . Positive genetic associations were estimated between TMY and 305d-MY(0.53) and LP(0.53).While (rg) were estimates negative TMY and AFG(-0.02) similar to the findings Mostafa *et al* (2013); Sanad and Afifi (2016) ; Çilek et al (2008) observed that Pearson correlations between the estimated BV for 305-d and TMY for cows was high significant (P<0.01) and as 0.876. However, Kaygisiz (2013) observed that Pearson correlations between the estimated BV for 305-dMY and TMD for cows and sires were notably high with 0.78(P<0.01) and 0.90 (P<0.01) respectively.

Rank correlation coefficients among breeding value for productive and reproductive traits are given in table 7. Rank correlation estimates between TMY, 305d-MY, LP, NSC and AFC were positive and highly significant, ranged from -0.15 to 0.59. On the other hand all rank correlation coefficients between reproductive traits were negative and ranged between -0.02 and -0.17. A nearly similar result was found by Mostafa *et al.* (1999) and Nazem *et al.* (2001).

Table 7. Rank correlation coefficients among breeding value for productive and reproductive traits in Friesian cows.

Traits	Rank correlation coefficients			
	305d	LP	NSC	AFC
TMY	0.52***	0.43***	-0.13***	-0.17***
305d-MY		0. 59**	0.01 ns	-0.03*
LP			-0.02*	-0.02 ns
NSC				0.15***

*** = significant at P< 0.05, ** = significant at P< 0.01, *** = significant at P<0.001, ns = non-significant**

Regression coefficients (b ± S.E)) of cows on AFC for Productive and reproductive traits in cows were negative or positive significant and non-significant for all studied traits (Table 8). This might be attributed to lack of cows' selection or to use of cows with variable genetic background from different sources. Abdel-Glil (1996) obtained regression coefficients of estimated breeding values of Holstein sires on time of -12.20 ± 8.4 kg/year, -4.5 ± 3.8 kg/year and 1.89 ± 0.94 day/year for TMY, 305-DMY and LP, respectively. Also, Elshalmani (2011) reported regression coefficients of estimated breeding values of Friesian sires on time of -7.030 kg/year, 0.001 day/year and - 0.096 day/year for MY, LP and DO, respectively, with no apparent specific genetic trend which reflected the lack of genetic progress achieved over time. Hammoud (2013) found that regression coefficients of estimated breeding values of Friesian sires on time of -50, 6, -50.4 and -0.83 for TMY, 305d and LP, respectively.

Table 8. Regression coefficients (b ± S.E)) of cows on AFC for Productive and reproductive traits in Friesian cows.

Traits	b ±SE
TMY	-2.65±5.27
305d-MY	-6.88±3.92
LP	-0.38±0.38
NSC	0.002±0.002

Cow BV minimum(min) ,maximum(maxi) , Range , Standard error (S.E) and accuracy of cow BV for milk productive traits (TMY , 305-d MY and LP and reproductive traits (NSC and AFC) are given in table.9 . The ranges of cow BV for (TMY), (305d-MY), (LP), (NSC) and (AFC) of Friesian cows in Sakha herds are 2822.59 kg, 1743.37kg, 2847.45 day , 0.75 and 7.68 months, respectively table.9, The wider the range the wider the genetic variation that gives the chance for improvement of the considered trait through selection of superior cows in BV. The ranges of estimates for traits higher than those recorded by Amr (2013) and Sanad (2016).

The accuracy of min and max estimates of cow BV Table .9 for TMY, 305d-MY, LP, NSC and AFC ranged from 0.63 to 0.95. Ismail (2006) showed that the accuracy of those traits ranged from 0.43 to 0.80.

Table 9. Min, maxi, Range, S.E and accuracy of predicted BV of studied traits.

Traits	Minimum	S.E	Accuracy	Maximum	S.E	Accuracy	Range
T MY	-902.97	464.27	0.69	1919.62	485.62	0.65	2823
305d-MY	-748.34	326.06	0.67	995.02	343.37	0.63	1744
LP	-906.64	465.79	0.69	1940.81	487.78	0.66	2847
NSC	-0.39	0.16	0.70	0.364	0.15	0.75	0.75
AFC	-1.88	0.61	0.95	5.8	0.79	0.92	7.68

Range = Maximum minus Minimum.

CONCLUSION

High and moderate heritability estimates suggest genetic improvement through selection to achieve higher productivity in future generations.The results of the study also indicate Low heritability (NSC) in Friesian cattle raised in Egypt, which means that it is difficult to improve this trait through direct selection, which can be improved by improving environmental conditions and good care. The study also identified the possibility of selecting superior cows based on the breeding value (BV) of genetic improvement for the following generations.

The study recommends that these superior cows should be selected on the basis of BV by detecting the location of the traits that affect the milk production of these cows through molecular genetics.

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التقييم الوراثي لبعض الصفات الانتاجية والتناسلية لأبقار الفريزيان المرباة في مصر

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أجريت الدراسة الحالية بهدف معرفة تأثير بعض العوامل الوراثية (المكافئ الوراثي والقيم الوراثية) بالإضافة الى معرفة تأثير العوامل الغير وراثية مثل (ترتيب موسم الحليب، موسم الولادة وسنة الولادة والتفاعلات بين هذه العوامل) على بعض الصفات الانتاجية والتناسلية (انتاج اللبن الكلى، ٣٠٥ يوم أنتاج لبن ،عددأيام الحليب، عددالتلقيحات اللازمة لحدوث اخصاب ،العمر عند أول ولادة). تم استخدام عدد ١٨٧٦سجل إنتاجي من ٥٨٦ بقرة بنات ٣٧٤ أم نسل ٥٨ طلوقة للمواسم التسعة الانتاجية أثناء الفترة من٢٠٠١إلى ٢٠١٥ في قطيع إنتاج اللبن محطة سخا (محطة حكومية) تابعة لوزارة الزراعة، مصر . تم اجراء التحليل باستخدام (SAS 2003) وتضمن النموذج (تأثير الاب) والتأثيرات الثابتة (ترتيب الموسم ، موسم الولادة وسنة الولادة) بهدف دراسة العوامل الثابتة، بينما تم تقدير المعالم الوراثية والمظهرية بواسطة برنامج نموذج الحيوان أحادي الصفه (Boldman et al. 1995)بطريقة single TDFREML لحساب h^2 والقيم المتوقعة BV للأبقار بغرض الانتخاب وكانت النتائج كالتالي:- ١- كان متوسط قيم صفات محصول اللبن الكلي، ٣٠ يوم أنتاج لبن،عدد مواسم الحليب، عدد التلقيحات اللازمة لحدوث اخصاب، العمر عند أول ولادة كانت ٤٠٣٨.٦كجم ، ٣٧٣٤.٨كجم ، ٣١٧.٨ يوم، ١.٩٣ تلقيحة و ٣٢.٤٩ شهر على التوالي. ٢- كانت قيم المكافئ الوراثي للصفات٠.١٧, ٠.٢٥ ,٠.١٧ ، ٠.٠٦، ٠.٣٦ على التوالي. ٣- تراوح الارتباط للقيم التربوية للصفات المدروسة من -٠.١٧ الى ٠.٥٩ وكانت معنوية وخاصة بين انتاج اللبن وطول موسم الحليب ،مما يدل على وجود تباين وراثي تجمعي في الاداء من الممكن استغلاله في تطبيق برامج الانتخاب ٤- كان مدي القيم التربوية BV للصفات المدروسة للبقرة ٢٨٢٢.٦كجم، ١٧٤٣.٤كجم، ٠.٧٥٤تلقيحة، ٢٨٤٧.٥ يوم و ٧.٦٨شهرعلي التوالي لذلك يمكن الانتخاب علي أساس القيم التربوية للبقرة CBV لصفات أنتاج اللبن لتحقيق التحسين الوراثي لصفات الدراسة عن طريق الانتخاب بالإضافة لزيادة الرعاية لتحسين الصفات التناسلية (عدد التلقيحات اللازمة لحدوث اخصاب، العمر عند أول ولادة) . بينت الدراسة ان انتخاب الابقار علي أساس القيمة التربوية المتوقعة يؤدي لزيادة أنتاج اللبن لذا توصي الدراسة بالتأكد من ذلك من خلال الوراثة الجزيئية للكشف عن مواقع الصفات الكمية التي تؤثر على أنتاج اللبن والانتخاب للأبقار التي تحمل هذه الجينات.