THE PRODUCTIVE AND REPRODCTIVE TRAITS OF FRIESIAN COWS IN EGYPT

Hammoud, M. H.

Received on: 28/11/2006 ***Accepted on: 26/12/2006***

ABSTRACT

Data relevant to 654 Friesian cows raised at the Dairy Unit of Milk and Meat Project of the Faculty of Agriculture, Alexandria University, between 1982-1999 were utilized to evaluate the productive and reproductive traits of Friesian cows. Also, The effects of sire, age at first calving, season and year of calving and parity were studied . The least squares analysis with unequal subclass numbers indicated that the overall least squares means of total milk yield, 305-days milk yield, lactation period, average daily milk yield, maximum daily milk yield, persistency and dry period were 4237.8 kg, 3948.2 kg, 302.7 day, 14.1 kg, 22.5 kg, 174.1 and 75.1 day, in respective order. Corresponding means for age at first calving, days open and calving interval were 29.6 month, 126.3 day and 399.8 day, respectively.

Sire had highly significant effect on all studied traits except the lactation period where the effect was not significant. Age at first calving had no significant effect on any of the traits under investigation except average daily milk yield which was highly significantly affected. Season of calving had highly significant effect on total milk yield , 305-days milk yield, average daily milk yield, maximum daily milk yield, persistency and age at first calving, but had no significant effect on lactation period, dry period, days open and calving interval. Year of calving and parity had highly significant influence on all studied traits except dry period which was influenced only significantly and nonsignificantly, respectively.

***Keywords:** Milk yield, lactation period, dry period, persistency, age at first calving, days open, calving interval, Friesian cows.*

INTRODUCTION

The huge expansion in demand for milk which will follow from the population growth is one of the most important challenges of dairying in Egypt. Minimizing the substantial genetic differences in milk production between local Baladi cattle and buffalo populations and improved Bos Taurus breeds is too large to be achieved even after hundred years of sustained highly efficient selection within native stocks. Therefore, it is immediately apparent that the most obvious way to exploit this would be to simply import Bos taurus cattle. This has been tried on many occasions in the past with unsatisfactory results (Sadek *et al.*, 1994 and Aly, 1995). Since the early seventies Friesian cattle from different countries were widely imported to Egypt to be raised as either pure-bred or crossed with local Balady cows (Badran *et al.*, 1991 and Aly 1995). Consequently, many governmental and commercial dairy farms were established where intensive production systems were applied (Sadek *et al.*, 1994).

Although milk yield is the major trait of economic importance in dairy farms, other traits such as age at first calving, lactation period, dry period, days open, and calving interval are affecting the profitability of dairy farms (Hammoud, 1997 and Tozer and Heinrichs, 2001).

The objectives of this investigation were to evaluate the productive and reproductive performance of Friesian cows herd and to study the effects of sire, age at first calving, season and year of calving and parity on total milk yield, 305-days milk yield, lactation period, average daily milk yield, maximum daily milk yield, persistency, dry period, age at first calving, days open, and calving interval.

MATERIALS AND METHODS

Source of data :

Data used in this investigation were collected from 2922 lactation records relevant to 654 pure Friesian cows which belong to the Dairy Unit of Milk and Meat Project of the Faculty of Agriculture, Alexandria University. These cows were daughters of 70 sires and each sire had at least three daughters. The project has been existing for over 24 years and the records used covered the period from 1982 to 1999. The productive traits under investigation were total milk yield in kilograms (TMY), 305-days milk yield in kilograms (305-DMY), lactation period in days (LP), average daily milk yield in kilograms (ADMY), maximum daily milk yield in kilograms (MDMY), persistency (PERS) and dry period in days (DP); and the reproductive traits were age at first calving in months (AFC), days open in days (DO) and calving interval in days (CI). Persistency was calculated by dividing total milk yield by peak yield (ao and Sundaresan, 1982).

Herd management :

Animals were housed free in shaded open yards, grouped according to their average daily milk yield, and fed ad libitum on berseem (*Trifolium alexandrinum*) from November till May and on Sorghum (*Sorghum bicolor)* along with berseem hay from June till October. They were also fed all year around on concentrate supplementary ration containing at least 14 % crude protein and 65 % total digestible nutrient. Feeding allowances were offered according to milk production and physiological status as recommended by NRC (1982). Water was also available ad libitum. Heifers were artificially inseminated for the first time when reaching 350 kgs of weight and pregnancy was detected by rectal

Department of Animal Production, Faculty of Agriculture, University of Alexandria, Alexandria, Egypt

palpation 60 days after service. The cows were machine milked twice a day at 06.00h and detected by rectal palpation 60 days after service. The cows were machine milked twice a day at 06.00 th and 18.00h.

Statistical procedures :

The data were analyzed using least squares analysis with unequal subclass numbers using Generalized Linear Model procedures (SAS, 1999) to estimate the effects of sire, age at first calving, season and year of calving and parity on the traits under investigation.

The statistical model used was as follows :

$Y_{ijklmn} = u + s_i + p_j + a_k + b_l + c_m + e_{ijklmn}$

Where,

Y_{ijklmn} : An observation of each trait.
U : The overall mean.
s_i : The random effect of the i^{th} sire.
p_j : The fixed effect of the j^{th} parity.
a_k : The fixed effect of the k^{th} age at first calving.
b_l : The fixed effect of the l^{th} season of calving.
c_m : The fixed effect of the m^{th} year of calving.
E_{ijklmn} : The random effect distributed with mean zero and variance s^2_e.

The same model was applied for age at first calving after excluding a_k.

RESULTS AND DISCUSSION

I- Productive traits:

Tables (1) and (2) show least square means and standard errors of the factors affecting productive traits. The overall means of TMY, 305-DMY, LP, ADMY, MDMY, PERS, and DP were 4237.8 kg, 3948.2 kg, 302.7 day, 14.1 kg, 22.5 kg, 174.1 and 75.1 day, respectively. These values were higher than the estimates reported by Aly (1995) on a similar herd of Friesian cattle in Egypt.

Sire had highly significant effects on all productive traits except LP which was not significantly affected. These results indicate the possibility of the genetic improvement of these traits, except lactation period, through sire selection. Most of these findings are similar to those reported by Gamal El-Dien (2006) and Nowier (2006). However, El-Barbary *et al.* (1999) found that sire had nonsignificant effect on traits of milk yields of Friesian cows.

The effects of age at first calving on all productive traits were not significant except on ADMY where the effect was highly significant. These results are in line with those found by El-Barbary *et al.* (1999) and Gamal El-Dien (2006). Contradictory results were obtained by Aly (1995), Tag El-Dien (1997) and Nowier (2006).

Season of calving had highly significant influence on all productive traits except LP and DP which were not significantly influenced. Winter calvers had the highest milk yields, autumn and spring calvers were intermediate and summers 's produced the lowest yield of milk. The high yields in winter could be attributed to better climatic conditions, feeding on breseem and the increase in the amount of feed intake. However, the decreased milk yields in summer may be attributed to the increased temperature and the low quality vegetative feed. Significant effect of season of calving on milk yields were reported by Tag El-Dien (1997), Gamal El-Dien (2006) and Nowier (2006). However, nonsignificant effects of season of calving on milk yields were depicted by El-Awady,1991; Amin,1992; Aly, 1995 and El-Barbary *et al.* 1999.

The effects of year of calving on all productive traits were highly significant except DP which was affected only significant, but no specific trends for these effects were indicated. The trends depended mainly on the conditions of individual animals, feeding and management practices and year to year climatic changes. The high yields were attained at the period from 1982-1984. The lack of trends were in agreement with those obtained by El-Awady (1991), El-Naday (1996), Tag El-Dien (1997), Gamal El-Dien (2006) and Nowier (2006).

Parity had highly significant effects on all productive traits except DP where the effect was not significant. Most of these findings are similar to those reported by El-Awady (1991), Amin (1992), Aly (1995) and Nowier (2006). Milk yields were increased with the increase of lactation order up to the third lactation and declined thereafter. The same trends were depicted by Sadek *et al.* (1994) and Tag El-Dien (1997) . This is logical due to the increase in age accompanied with the increase in body weight and to the full development of the udder secretory tissues. On the other hand, nonsignificant effects of parity on milk yields were depicted by El-Barbary *et al.* 1999.

II- Reproductive traits:

The least square means and standard errors of the factors affecting reproductive traits are presented in Table (3). The overall means of AFC, DO and CI were 29.6 month and 126.3 and 399.8 day, respectively. These values were lower than estimates reported by Aly (1995) on a similar Friesian herd in Egypt, which indicated higher reproductive efficiency of this herd.

Sire had highly significant effect on AFC, DO and CI. This indicates that sire selection is useful for the genetic improvement of these traits. Similar results were documented by Amin (1992). In addition, highly significant effects of sire on DO and CI were documented by Tag El-Dien (1997). However, nonsignificant effects of sire on AFC, DO and CI were indicated by Hammoud (1997). Moreover, nonsignificant effects of sire on Do and CI were found by Aly (1995) and Gamal El-Dien (2006).

DO and CI were increased with increasing age at first calving. However, the effect of age at first calving on DO and CI was not significant. The results obtained are in agreement with those indicated by Tag El-Dien, 1997; Alemam, 2002; Gamal El-Dien, 2006; and Nowier, 2006.

Cows calved in winter and spring had longer AFC, DO and CI than those calved in summer and autumn. Season of calving had highly significant influence on AFC, but had nonsignificant influence on DO and CI. Hammoud (1997) found nonsignificant effects for season of calving on AFC, DO and CI. Moreover, Tag El-Dien (1997) and Alemam (2002) indicated that season of calving had nonsignificant influences on Do and CI. On the other hand, El-Nady (1996) and Gamal El-Dien (2006) reported that days open were affected significantly by season of calving.

The longest AFC, DO and CI were recorded on cows calved during the years 1991-1993, 1994-1996 and 1997-1999. Year of calving had highly significant effect on AFC, DO and CI. Similar effects were reported by Hammoud (1997). In addition, El-Nady, 1996; Tag El-Dien, 1997; Alemam, 2002; Gamal El-Dien, 2006 and Nowier, 2006 reported highly significant effect of year of calving on DO and CI.

AFC, DO and CI decreased with increasing the parity which affected them highly significantly. El-Nady, 1996; Tag El-Dien, 1997; Alemam, 2002; and Nowier, 2006 reported highly significant effect of parity on DO and CI.

The results suggest that the animals of this investigation did not reach their maximum genetic potential, therefore the managerial systems and appropriate environmental conditions might have positive effects on improving the productive and reproductive traits of Friesian cows of this herd.

ACKNOWLEDGMENTS

The author is grateful to Dr. Mamdouh A. Samak and Dr. Ali M. Allam, the previous Director Managers of the Project, to the late Dr. Ahmed A. Radwan, the previous Manager of the Project and to Mr. Khaled Abd El-Aziz, the dairy specialist of the Project for their kind help and cooperation in data collection.

Table (1) : Least-square means (LSM) and standard errors (SE) of factors affecting TMY, 305-DMY, LP and ADMY.

Factor	No	TMY (kg)	305-DMY (kg)	LP (day)	ADMY (kg)
		LSM±SE	LSM±SE	LSM±SE	LSM±SE
Overall mean	2922	4237.8±23.7	3948.2±19.1	302.7±1.6	14.1±0.1
Sire (1-70)		**	**	NS	**
Minimum		3416.7±347.6 (24)	3035.3±280.4 (24)	249.1±19.5 (48)	11.6±0.8 (47)
Maximum		5476.1±377.4 (22)	4550.9±304.4 (22)	385.4±44.4 (5)	16.2±0.6 (35)
Age at first calving		NS	NS	NS	**
AFC≤24	177	4202.9±125.2	3905.2±101.0	306.1±8.6	13.8±0.3
24<AFC≤28	851	4248.5±73.8	3930.7±59.6	308.8±5.1	14.0±0.2
28<AFC≤32	981	4275.8±71.3	3988.9±57.5	303.1±4.9	14.3±0.1
32<AFC≤36	765	4209.4±76.1	3906.9±61.7	303.4±5.2	13.9±0.2
AFC>36	148	4252.3±133.7	4009.2±107.8	292.1±9.1	14.8±0.3
Season of calving		**	**	NS	**
Winter	630	4422.6±81.4	4137.7±65.7	303.9±5.6	14.7±0.2
Spring	579	4228.4±83.5	3893.1±67.3	304.4±5.7	14.1±0.2
Summer	889	4066.2±74.3	3771.0±59.9	301.5±5.1	13.6±0.2
Autumn	823	4234.0±75.9	3990.9±61.2	301.0±5.2	14.2±0.2
Year of calving		**	**	**	**
1982-84	545	4414.2±210.1	4432.7±169.5	260.6±14.4	16.5±0.4
1985-87	540	3810.4±146.6	3657.6±118.2	290.8±10.0	13.3±0.3
1988-90	549	4103.1±99.7	3892.8±80.4	302.5±6.8	13.7±0.2
1991-93	427	4380.1±96.9	3948.6±77.4	312.0±6.6	14.2±0.2
1994-96	510	4532.6±126.9	4112.0±102.4	325.5±8.7	14.2±0.3
1997-99	351	4186.2±169.5	3645.5±136.8	324.7±11.6	12.9±0.4
Parity		**	**	**	**
1st	654	4399.5±98.2	3926.0±79.2	336.9±6.7	13.2±0.2
2nd	555	4507.3±92.0	4050.6±74.2	338.7±6.3	13.5±0.2
3rd	474	4760.2±87.5	4400.7±70.6	323.5±6.0	15.1±0.2
4th	386	4451.5±88.1	4116.2±71.1	317.3±6.0	14.2±0.2
5th	300	4569.8±100.0	4258.2±80.7	319.1±6.8	14.5±0.2
6th	230	4206.9±116.1	3999.1±93.7	286.0±±7.9	14.7±0.2
7th	163	4056.9±143.2	3861.7±115.5	266.8±9.8	14.2±0.3
8th and over	160	2950.1±161.1	2973.5±130.0	213.2±11.0	13.6±0.3

NS : Not significant (P>0.05), ** : Highly significant (P< 0.01).
Figures in parentheses indicate the number of observations.

Table (2) : Least-square means (LSM) and standard errors (SE) of factors affecting MDMY, PERS and DP.

Factor	MDMY (kg)		PERS		DP (day)	
	No	LSM±SE	No	LSM±SE	No	LSM±SE
Overall mean	2922	22.5±0.1	2844	174.1±0.7	2434	75.1±0.7
Sire (1-70)		**		**		**
Minimum		18.9±1.5 (12)		139.5±19.7 (5)		56.3±12.5 (9)
Maximum		30.5±1.5 (13)		203.9±8.4 (51)		113.3±10.8 (18)
Age at first calving		NS		NS		NS
AFC≤24	177	22.2±0.4	173	175.2±3.8	144	70.3±3.9
24<AFC≤28	851	22.4±0.2	820	177.5±2.3	713	73.3±2.3
28<AFC≤32	981	22.5±0.2	962	174.3±2.2	831	74.7±2.2
32<AFC≤36	765	22.2±0.3	746	173.0±2.3	627	78.4±2.4
AFC>36	148	23.2±0.5	143	170.6±4.1	119	78.9±4.1
Season of calving		**		**		NS
Winter	630	23.5±0.3	614	172.9±2.5	517	76.4±2.6
Spring	579	23.4±0.3	557	164.7±2.6	483	75.6±2.6
Summer	889	21.2±0.3	874	178.3±2.3	748	73.7±2.3
Autumn	824	22.0±0.3	799	180.6±2.3	686	74.8±2.4
Year of calving		**		**		*
1982-84	545	25.2±0.7	545	170.0±6.5	488	80.7±6.4
1985-87	540	22.9±0.5	540	156.2±4.5	450	74.3±4.5
1988-90	549	23.0±0.3	549	164.8±3.0	455	70.2±3.1
1991-93	427	21.7±0.3	407	179.0±2.9	330	76.2±3.2
1994-96	510	22.5±0.4	792	182.0±3.9	448	73.1±3.1
1997-99	351	19.8±0.6	311	192.8±5.3	263	76.2±5.3
Parity		**		**		NS
1st	654	19.9±0.3	639	201.5±3.0	596	67.6±3.0
2nd	555	21.9±0.3	543	186.9±2.8	490	73.6±2.8
3rd	474	24.5±0.3	464	179.2±2.7	406	70.9±2.7
4th	386	23.0±0.3	379	178.3±2.7	325	78.0±2.7
5th	300	23.6±0.3	295	177.5±3.0	256	77.6±3.0
6th	230	23.6±0.4	220	165.2±3.6	183	77.7±3.6
7th	163	23.0±0.5	156	165.7±4.4	111	76.9±4.6
8th and over	160	20.6±0.6	148	138.8±5.0	67	78.6±5.6

NS : Not significant (P>0.05), * : Significant (P< 0.05), ** : Highly significant (P< 0.01).
Figures in parentheses indicate the number of observations.

Table (3) : Least-square means (LSM) and standard errors (SE) of factors affecting AFC, DO and CL

Factor	AFC (month)		DO (day)		CI (day)	
	No	LSM±SE	No	LSM±SE	No	LSM±SE
Overall mean	2922	29.6±0.1	2560	126.3±1.6	2434	399.8±1.6
Sire (1-70)		**		**		**
Minimum		24.8±0.8 (22)		78.4±22.5 (29)		367.4±19.4 (29)
Maximum		35.5±0.6 (24)		211.2±40.5 (5)		482.2±44.8 (4)
Age at first calving				NS		NS
AFC≤24			152	122.0±8.4	144	394.7±8.7
24<AFC≤28			752	130.5±5.0	713	401.2±5.2
28<AFC≤32			867	124.3±4.9	831	399.6±5.3
32<AFC≤36			660	131.3±5.2	627	406.7±5.4
AFC>36			129	123.4±8.9	119	397.3±9.3
Season of calving		**		NS		NS
Winter	630	30.1±0.2	546	124.8±5.4	517	400.2±5.7
Spring	579	29.5±0.2	508	132.7±5.6	483	405.0±5.8
Summer	889	29.1±0.1	775	124.2±5.1	748	397.4±5.3
Autumn	824	29.7±0.1	731	123.4±5.2	686	397.0±5.4
Year of calving		**		**		**
1982-84	545	25.6±0.5	501	79.0±13.8	488	349.4±14.3
1985-87	540	27.2±0.3	455	116.5±9.8	450	388.3±10.1
1988-90	549	28.9±0.2	475	107.0±6.8	455	381.4±7.0
1991-93	427	30.3±0.2	347	146.6±6.9	330	423.5±7.2
1994-96	510	32.0±0.2	473	146.5±8.6	448	424.1±9.0
1997-99	351	33.6±0.3	309	162.4±11.4	263	432.5±11.9
Parity		**		**		**
1st	654	31.9±0.2	608	140.2±6.5	596	415.8±6.7
2nd	555	31.3±0.2	515	152.1±6.1	490	424.8±6.4
3rd	474	30.1±0.2	434	130.7±5.8	406	405.6±6.0
4th	386	29.8±0.2	342	130.8±5.9	325	406.0±.6.1
5th	300	29.4±0.2	272	126.3±6.6	256	401.9±6.8
6th	230	28.8±0.3	193	118.0±7.8	183	391.0±8.0
7th	163	28.0±0.3	117	119.8±9.9	111	391.8±10.3
8th and over	160	26.8±0.4	79	92.9±11.8	76	362.2±12.6

NS : Not significant (P>0.05), ** : Highly significant (P< 0.01).
Figures in parentheses indicate the number of observations.

REFERENCES

Alemam, M.A. (2002). Evaluation of reproductive performance of dairy cattle under different production systems. M.Sc. Thesis, Fac. Agric., Mansoura Univ., Egypt.

Aly, H.M. (1995). Genetical and non-genetical factors affecting performance traits in Friesian cattle in Egypt . Ph.D. Thesis, Fac. Agric., Alex. Univ., Egypt.

Amin, A.A (1992). Evaluation of the productivity of some exotic dairy cattle breeds under Egyptian conditions. M. Sc. Thesis, Fac. Agric., Suez Canal Univ, Egypt.

Badran, A. E. ; Aziz, M. A. and Sharaby, M. A. (1991). Variation in performance of Friesian cows under two environmental conditions. Alex. J. Agric. Res., 36: 83.

El-Awady, H.G. (1991). Phenotypic and genetic parameters of lifetime production traits on Friesian cattle. M.Sc. Thesis, Fac. Agric., Tanta. Univ., Egypt

El-Barbary, A.S.A.; Mahady, A.E.; El-Shafie, O.M. and Aly, H.M. (1999). Some factors affecting milk production and milk constituents and their relation to udder measurements in pure Friesian cows. Alex. J. Agric. Res.,44: 17.

El-Nady, E.S. (1996). Genetic study of fertility traits and productive in different parities in a commercial herd of Friesian cattle cows in Egypt. M.Sc. Thesis, Fac. Agric., Tanta. Univ., Egypt

Gamal El-Dien, Y.M. (2006). Studies on genetic improvement in farm animals. M.Sc. Thesis, Fac. Agric., Mansoura Univ., Egypt.

Hammoud, M.H. (1997). Selection indexes for genetic improvement of some economic traits in Friesian cattle in Egypt. Ph.D. Thesis, Fac. Agric., Alex. Univ., Egypt.

Nowier, A.M. (2006). A comparison between sire model and animal modl for some economic traits on Friesian cattle in Egypt. M.Sc. Thesis, Fac. Agric., Tanta. Univ., Egypt

NRC, (1982). Nutrient requirements of dairy cattle. National Academy of Science, National Research Council. Washington, D.C. USA.

Rao, M.K. and Sundaresan. M. (1982). Factors affecting the shape of lactation curve in Friesan x Sahiwal crossbred cows. Indian J. Dairy Sci., 33:160.

Sadek, R. R. ; Helali, E. A. ; Safwat, M. A. ; Ibrahim, S. A. M.; and Abd El-fatah, A. (1994). Evaluation of Friesian cattle performance in commercial Farms in Egypt. Egypt. J. Anim. Prod., 31:43.

SAS (1999). SAS User guide: Statistics. Version 8 edition. SAS Institute Inc., Cary, NC.

Tag El-Dien, M.A. (1997). Studies on cattle, phenotypic and genetic parameters of some performance traits in Friesian cattle. Ph.D. Thesis, Fac. Agric., Alex. Univ., Egypt.

Tozer, P. R. and Heinrichs, A. J. (2001). What affects the costs of raising replacements dairy heifers: a multiple-complement analysis. J. dairy Sci., 84 ; 1836.

الملخص العربي

الصفات الإنتاجية والتناسلية لأبقار الفريزيان في مصر

محمد حسن حمود

قسم الإنتاج الحيواني- كلية الزراعة- جامعة الإسكندرية

أجرى هذا البحث على بيانات قطيع أبقار الفريزيان بوحدة إنتاج الألبان واللحوم- كلية الزراعة- جامعة الإسكندرية. وقد شملت الدراسة ٦٥٤ بقرة فريزيان لها ٢٩٢٢ سجلاً تناسلياً وإنتاجياً خلال الفترة من ١٩٨٢ وحتى ١٩٩٩. واستهدف البحث تقويم الصفات الإنتاجية والتناسلية لأبقار الفريزيان في قطيع إنتاجي.

تم تحليل البيانات إحصائياً بطريقة الحد الأدنى للمربعات، وتتلخص أهم النتائج المتحصل عليها فيما يلي :

١ – المتوسط العام: بلغ المتوسط العام لإنتاج اللبن الكلي ٤٢٣٧,٨ كجم، لإنتاج اللبن في ٣٠٥ يوم ٣٩٤٨,٢ كجم، لطول موسم الحليب ٣٠٢,٧ يوم، إنتاج اللبن اليومي ١٤,١ كجم، لأقصي إنتاج لبن يومي ٢٢,٥ كجم، للمثابرة على الإدرار ١٧٤,١، لطول فترة الجفاف ٧٥,١ يوم، للعمر عند أول ولادة ٢٩,٦ شهر، لطول فترة التلقيح ١٢٦,٣ يوم وللفترة بين الولادتين ٣٩٩,٨ يوم.

٢ – الأب : له تأثيراً معنوياً جداً علي الصفات العشر موضع البحث ما عدا طول موسم الحليب حيث كان التأثير غير معنوياً.

٣ – العمر عند أول ولادة : له تأثيراً غير معنوياً علي كل الصفات موضع الدراسة ما عدا متوسط إنتاج اللبن اليومي حيث كان التأثير معنويا جداً.

٤– موسم الولادة : له تأثيراً معنوياً جداً علي جميع الصفات ما عدا طول موسم الحليب، فترة الجفاف ، فترة التلقيح والفترة بين الولادتين حيث كان التأثير غير معنوياً.

٥ – سنة الولادة : لها تأثيراً معنوياً جداً علي كل الصفات ما عدا طول فترة الجفاف حيث كان التأثير معنوياً فقط.

٦ – ترتيب موسم الحليب : له تأثيراً معنوياً جداً علي جميع الصفات ما عدا فترة الجفاف حيث كان التأثير غير معنوياً.

توضح نتائج هذا البحث أن لنظم الرعاية المناسبة والظروف البيئية الملائمة أثراً كبيراً علي تحسين الأداء الإنتاجي والتناسلي لأبقار الفريزيان في هذا القطيع.