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STUDIES ON FRIESIAN CATTLE IN EGYPT I.ENVIRONMENTAL FACTORS AFFECTING MILK PRODUCTION.

sFarrag,F.H.H.[1];A.S.A.El-Barbary[2];M.F.Abdel-Glil [2] andK. Hussein[3] .

*** Dept. of Animal production, Fac. of Agric., Mansoura Univ., Mansoura Egypt.**

**** Dept . of Animal production and Fish, Fac. of Agric .Alexandria Univ. Alexandria, Egypt.**

***** Dept. of Animal breeding, Animal production Research Institute, Ministry of Agriculture, Egypt.**

ABSTRACT

Total of 1797 records of 765 cows raised in El-Shazly private farm . located in Shobratana – Basyon , Gharbia , Governorate were collected during period from 1985 to 1993 to study the effect of some environmental factors on milk production of Friesian Cattle .

The result obtained could be summarized in the following .

Parity had non- significant effect on all traits study except the effect on 90 days cumulative milk yield was highly significant (P< 0.01) .Year of calving and significant (P< 0.01) effect on different studied traits .

Season of calving had highly significant (P< 0.01) effect on cumulative 90 and 180 days milk yield, and only significant (P< 0.01) effect on total milk yield , lactation period and on the five method used for estimating persistency of lactation .But it is had non significant effect on both 305 and 270 days milk yield .

INTRODUCTION

In Egypt, Cattle play an effective role in meeting the demand of human for milk and meat. The amount of milk yield is inadequate and for to meet the needs of the ever growing human population. So, since the Friesian breed had been established, it had been most frequently imported to the tropics for either breeding pure or improving productivity of the local breeds by grading or crossing (Tag El-Dein 1990). In this trend, in Egypt Friesian cattle was imported on a large scale and nowadays quite good number of Friesian herds are established. The economic return is dependent on the role of reproductive and productive performance of there cows of each independent herd.

This study reflect some of the knowledge of the relationship between productive traits and several environmental factors , such as parity , year of calving and season of calving and its important effective role in controlling the dairy production programs in one of dairy herd mentions in the Nile Delta in Egypt .

MATERIAL AND METHODS

Total of 1797 records of pure 756 pure Friesian cows raised in El-Shazly private farm , located in Shbratanta, Basyon, Gharbia, Governorate .

The milk records were covered the period from 1985 to 1993 .

The production milk traits (Total milk yield (kgs) (TMY) , 305 days milk yield (kgs) (M305) , lactation period (days) (LP) , cumulative 90 day milk yield (kgs) (90DMY) , cumulative 180 days milk yield (kgs) (180 DMY) , cumulative 270 day milk yield (kgs) (270 DMY) and persistency of lactation (PL) were statistically analyzed .

The Feeding procedure of the animals were based on berseem (*Trifolum alexandriamum*) and rice straw from beginning of December till the end of May, and concentrate mixture plus rise straw and clover hay from the beginning of June till the end of November, Daily rations was given to animals according to productivity. At the last two months of pregnancy, animals feed according to body weight . Animals were all owed to drink the water freely. Milking were twice a day 7.00 and 16.00 until two months before next expected calving time then it dried . All cows were naturally mated. Heifers were mated when either reached about 330 kg body weight or 24 months of age. cows were bred during the first heat period after the 60^{th} day postpartum. Pregnancy was detected by rectal palpation 60 day after service.

Measurements of persistency:

Persistency has been defined in several ways, either as ratios of different part lactation yield (Khattab, 1984) or derived from factors in lactation curve models as proposed by Wood (1967). High correlations have usually been found among several criteria of persistency of different types (Solkner and Fuche, 1987).

Six measurements of persistency were computed for each record as following:-

1.The first six months of lactation period were divided into equal intervals each of three months. Persistency of an individual records was calculated as Khattab (1984):

$$P_1 = \frac{Y_{32}}{Y_{31}}$$

Where:

P_1 is the perhsistency calculated for a 6-months of lactation period divided into two intervals each of three months, and Y_{31} and Y_{32} are the milk produced in the first and the second three months intervals, respectively.

2. Lactation period was first 8 months of lactation divided into four intervals each of two months. Persistency was calculated as the sum of the weighed ratio of the milk produced in each two successive intervals according to the following formula (Khattab, 1984):

$$P = 100\sum_{1=1}^{3} W_i R_i$$

Where:

P is the persistency calculated for a 8-months of lactation period divided into four intervals each of two months. R_i is the ratio of the milk produced in each two successive intervals each of two months, and W_i calculated as:

$$Wi = R_i / \sum_{1=n}^{3} R_i$$

i = 1, 2, 3, ...

3. The peak of the lactation was assumed to be reached within the first two months after calving, the first month of lactation was skipped and 8-months of lactation period was divided into four intervals each of two months. The milk produced in the four intervals and denoted by Y_{921}, Y_{922}, Y_{923}, Y_{924}, respectively as Khattab (1984).

Persistency number 3 was calculated as the same formula used in calculating in persistency number 2. The only differences was that in persistency number 3, the first month at the beginning of the lactation period was skipped as .

$$4\text{- } P = \frac{\text{Milk production in the second 100 days}}{\text{Milk production in the first 100 days}} \times 100$$

As Gianci (1963).

$$5\text{- } P = \frac{A - B}{B}$$ as Gill *et al*. (1970).

Where:

A is the total lactation yield in 300 days and B is the yield up to the first 90 days of lactation.

$$6\text{- } P = \frac{A - B}{B}$$ as Hussein (1991).

Where:

A is the milk yield during the first 180 days and B is the milk yield producing during the first 10 weeks of lactation.

Statistical analysis:

Data for the first three lactations were analyzed using least squares and maximum likelihood program of Harvey (1987).

Model of analysis:

Data of milk productive traits (i.e. total milk yield, 305-days milk yield and lactation period), 90, 180 and 270 days cumulative milk yield and persistency values were analyzed using the linear mixed model:-

$$Y_{ijkmn} = S_i + P_j + Y_k + B_m + b1_L (X1_{ijkmn} - X1) + b1_Q (X1_{ijkmn} - X1)^2 + e_{ijkmn}$$

Where:

Y_{ijkmn} = The observation on the ikmn lactation,

S_i = The random effect of i^{th} sire,

P_j = The fixed effect of j^{th} parity (j = 1, 2, 3),
Y_k = The fixed effect of k^{th} year of calving,
B_m = The fixed effect of m^{th} season of calving (m = 1, 2, 3, 4)
Where 1 = Autumn, 2 = Winter, 3 = Spring, and 4 = Summer;
$b1_L$ and $b1_Q$ = The linear and quadratic partial regression coefficients of productive and cumulative milk yield traits lactation of $X1_{ijkmn}$ lactation on age of cow at calving,
$X1_{ijkmn}$ = The age of the cow at calving in months for corresponding Y_{ijkmn} records,
X1 = The mean of $X1_{ijkmn}$, and
e_{ijkmn} = A random error particular to the ijkmnth lactation and assumed to be independently randomly distributed with mean zero and variance $\sigma^2 e$, i.e. NID (0, $\sigma^2 e$).

RESULTS AND DISCUSSION

Least square means ± standard errors and significant levels of effect of parity year of calving and season of calving on total milk yield , 305 days milk yield and lactation period are shown in Table (1).

Table (1): Least square means and standard errors (S.E) and levels of significance for effect of parity, year and season of calving on some productive traits.

Classification	No.	Total milk yield (kgs) x ± S.E.	305-days milk yield (kgs) x ± S.E.	Lactation period (days) x ± S.E.
Overall mean:	1797	4765.9±189.7	4566.8±137.7	309.6±11.2
Parity:		N.S.	N.S.	N.S.
1	756	4730.2±220.6	4526.4±169.9	305.4±13.3
2	618	4743.7±197.9	4683.5±146.4	308.7±11.8
3	423	4823.9±222.8	4585.5±172.2	314.6±13.5
Year of calving:		**	**	**
85	392	4238.8±230.9	4081.9±180.4	3040±14.1
86	341	3734.1±221.9	3540.9±171.3	319.5±13.4
87	302	5957.8±210.6	3180.5±159.7	331.8±12.6
88	163	4105.9±222.4	3832.8±171.7	350.1±13.5
89	91	4643.9±243.6	4247.6±193.0	292.9±14,4
90	118	5339.1±228.6	5122.3±178.0	299.4±13.9
91	122	4890.6±233.1	4628.1±182.6	301.8±14.2
92	152	6080.7±239.7	5792.5±189.1	309.5±14.7
93	116	5802.4±267.0	6044.5±215.8	277.3±16.5
Season of calving:		*	N.S.	*
Autumn	967	4587.7±199.3	4498.9±147.9	288.8±11.9
Winter	147	4764.2±307.2	4321.4±254.3	298.7±19.2
Spring	292	4879.6±190.8	4750.1±138.8	324.6±11.3
Summer	391	4832.2±182.6	4696.6±129.9	315.2±10.7
Reg. (AGE):				
Linear	1797	12.25±7.33	12.28±6.49	-1.02±0.47
Quad.	1797	-0.71±0.23	-0.83±0.20	0.02±0.01

N.S. = Not significant
*** = significant (p< 0.05)**
**** = Highly significant (p< 0.01)**

The overall means of total milk yield , 305 days milk yield and lactation period in this study overaged 4765.9 kgs , 4566.8 kgs and 309.6 days respectively. These values are higher than those reported as 2461kgs and

2165kgs by Abdel-Glil (1996) , 3698 and 3211kgs Marzouk (1998) and 2828 and 2545kgs by Badawy and Oudah (1999) for total milk yield and 305 days milk yield , respectively . on the other side , the values of total milk yield and 305 days milk yield are lower being 5465 and 5037kgs , respectively as reported by Tag El – Dein (1997) .

The average of lactation period was 309.6 days in this study . This value is shorter than 352 days 333 days and 334 days as reported by Aly (1995) Abdel-Glil (1996) , Badawy and Oudah (1999) , respectively . While it is longer than 300 days and 292 days as reported by El-Nady (1996) and Swylem (1998) , respectively.

Least square meanes ± standard errors and significant levels of effect of parity , year of calving and season of calving on total milk yield , 305 days yield and lactation period are shown in Table (1). Parity had non significant effects on all traits under the study . Both total milk yield , 305 days yield and lactation period increased linearly with advanced age of animal. The first parity ; cows had the lowest values (4730.2 kgs , 4526.4kgs and 305.4 days) , respectively but while the third lactation showed the highest value for TMY , M305 and L.P (4823.9 , 4585.5 kg and 314.6 days; respectively) the second lactation had the highest values (4683.5kgs) for 305 days milk yield . This is obvious on the consequent lactations parallel with the increases in weight and size and development in udder function as a result of increase in age with increase in consumption and feed utilization . These conclusion is inagreement with Badawy (1988), Tag El – Dein (1990) and El-Barbary *et al* (1992). Year of calving had highly significant ($p< 0.01$) effect on total milk yield , 305 days milk yield and lactation period . The year of 1992 had the highest values (6044.5kgs) for 305 days milk yield and their of 1988 had the highest values (350.1 days) for lactation period.

The differences between averages of the milk yield traits in this study reflected the changes from year to other in climatic , nutritional and managerial conditions . Similar observations were recorded by Abdel – Glil (1991), Mokhtar (1995).Shalaby (1996), Tag El- Dein (1997) and El-Awady (1998).

The effect of season of calving was significant ($P< 0.o5$) on total milk yield and lactation period , while it was non significant on 305 days milk yield . The spring and summer seasons showed higher values (4879.6 and 4832.2 kgs) for total milk yield , (4750.1 and 4696.6 kgs) for 305 days milk yield and (324.6 and 315.2 days) for lactation period , respectively . In fact ,the environment condition as a whole and specially the available good quality of green feed-stuff available from the starting of lactation and during the effective first part of lactation period with no doubt had quite excess effect in spring than other season similar finding recorded by Abdel-Bary *et al.* (1992). El-Barary *et al* (1992), Shalaby (1996) and El-Awady (1998) .

Estimates of Partial Linear and quadratic regression coefficients of total milk yield 305 day milk yield and lactation period on age at calving are presented in Table (1). It could be noticed that the linear regression coefficient of total milk yield and 305 day milk yield on age at calving were positive and non significant. While, negative and only significant with lactation period. The quadratic regression coefficients of total milk yield and 305 day

milk yield on age of calving were negative and highly significant , while lactation period on age at calving was positive and non significant .

These results accordance with findings of Khattab and Ashmawy (1990) and Khalil *et al.* (1994).

On other hand, Shalaby (1996). reported non significant for milk production , but significant for lactation period .

Least square means ± standard errors and significant levels of effect of parity , year of calving and season of calving on 90, 180 and 270 days cumulative milk yield are presented in Table (2) .

Table (2): Least square means and standard errors (S.E) and level of significant for effect of parity, year and season of calving on 90, 180 and 270 days cumulative milk yield .

Classification	No.	Cumulative milk yield (kgs)		
		90 days x ± S.E.	180-days x ± S.E.	270-days x ± S.E.
Overall mean:	1797	1525.8±44.6	2872.2±90.2	3973.2±114.2
Parity:		**	N.S.	N.S.
1	756	1436.4±55.9	2771.8±107.3	3866.1±140.7
2	618	1569.9±47.7	2878.4±94.8	3971.0±121.4
3	423	1571.3±56.7	2968.0±108.6	4082.5±142.6
Year of calving:		**	**	**
85	392	1389.1±59.5	269.1±113.0	3676.9±149.3
86	341	1200.4±56.4	2154.0±108.1	2948.1±141.8
87	302	1319.4±52.3	2360.9±101.8	3176.3±132.3
88	163	1147.1±56.5	2178.2±108.3	3055.9±142.2
89	91	1553.7±63.9	2957.7±119.9	4150.8±159.7
90	118	1727.8±58.7	3267.4±111.7	4490.1±147.4
91	122	1528.1±60.3	2870.5±114.2	4020.3±151.1
92	152	1769.5±62.6	3504.8±117.7	5036.4±156.5
93	116	2097.5±71.8	3867.9±132.5	5203.9±178.5
Season of calving:		**	**	N.S.
Autumn	967	1445.1±48.2	2786.1±95.6	3870.3±122.6
Winter	147	1483.4±85.0	2880.1±154.0	4024.8±210.3
Spring	292	1666.6±45.0	2977.4±90.8	4047.8±115.1
Summer	391	1508.2±41.8	2847.3±86.2	3949.9±107.8
Reg. (AGE):				
Linear		8.02±2.20	14.69±3.79	17.28±5.35
Quad.		-0.07±0.07	-0.72±0.12	-0.90±0.17

N.S. = Not significant
*** = significant (p< 0.05)**
**** = Highly significant (p< 0.01)**

The overall means of 90 , 180 and 270 days cumulative milk yield obtained were higher than those report by Badawy (1994) and Aly (1995) , and it were lower than those reported by Abouel- Anian (1995). This differences attributed to milk yield in this study and those in other research for Friesian cattle the differences in feeding , management and weather .

Parity had highly significant (P< 0.05) effect on 90 days cumulative as found by Aly (1995) , but it had non significant effect on 180 and 270 days cumulative milk yield with disagreement of the finding of Badawy (1994) and Aly (1995) . The highest overall means of 90 , 180 and 270 days cumulative were obtained in the third parities as shown by milk yield were obtained in third parities as shown by Badawy (1994) and Aly (1995) .

The combination of the effects of maturation in body weight , size and function of mammary gland increase in feed intake and feed utilization

factors, lead to increase in milk synthesis and secretion of the udder with progressive in parity .

Highly significant (P< 0.05) was observed for year of calving on 90,180 and 270 days milk yield. Year 1993 represent the values (2097.5,3867.9 and 5203.9 kgs respectively) The significant effect too was recorded by Badawy (1994) and Aly (1995) . The observed changes in cumulative milk production from year to another can be attributed to changes in herd size , age of animals and the fluctuated improvement in the managerial practices introduced from year to year .

Highly significant (P<0.01) effects were observed for season of calving on 90 and 180 days cumulative milk yield , while , non significant effect on 270 days cumulative milk yield spring season showed the higher values (1666.6 , 2977 and 4047.8 kgs) for 90 , 180 and 270 days cumulative milk yield , respectively .Badawy (1994) and Aly(1995) obtained similar results . The favorable climatic conditions for good quality clover and by the way favorable condition for milk secretion during spring responsible for this results .Least square means ± standard errors and significant levels of effect of parity , year of calving and season of calving on persistency of lactation are present in Table (3) .

Table (3): Least square means and standard errors (S.E) and levels of significant for effect of parity, year and season of calving on persistency of lactation (P) .

Classification	No.	P_1 A x ± S.E.	P_2 A x ± S.E.	P_3 A x ± S.E.	P_4 A x ± S.E.	P_5 A x ± S.E.	P_6A x ± S.E.
Overall mean:	1797	0.822±0.006	0.900±0.005	0.881±0.009	0.802±0.008	1.580±0.044	0.132±0.002
Parity:		N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
1	756	0.806±0.015	0.887±0.013	0.864±0.018	0.782±0.015	2.573±0.077	0.127±0.005
2	618	0.839±0.010	0.912±0.008	0.892±0.012	0.816±0.010	2.586±0.055	0.133±0.003
3	423	0.823±0.016	0.902±0.013	0.886±0.019	0.808±0.016	2.581±0.080	0.134±0.005
Year of calving:		* *	* *	* *	* *	* *	* *
85	392	1.004±0.017	0.990±0.014	0.945±0.020	0.966±0.017	2.478±0.085	0.160±0.005
86	341	0.809±0.015	0.888±0.012	0.876±0.018	0.798±0.015	1.956±0.077	0.121±0.004
87	302	0.760±0.013	0.852±0.010	0.826±0.015	0.747±0.013	1.989±0.065	0.114±0.004
88	163	0.781±0.015	0.873±0.013	0.846±0.018	0.760±0.016	1.960±0.077	0.123±0.004
89	91	0.834±0.020	0.938±0.016	0.925±0.023	0.824±0.020	2.731±0.097	0.134±0.006
90	118	0.782±0.017	0.898±0.014	0.808±0.020	0.759±0.017	2.848±0.085	0.133±0.006
91	122	0.783±0.018	0.907±0.015	0.912±0.021	0.772±0.018	2.591±0.089	0.130±0.005
92	152	0.879±0.019	0.950±0.016	0.948±0.022	0.857±0.019	3.485±0.093	0.153±0.005
93	116	0.774±0.024	0.857±0.019	0.841±0.027	0.734±0.023	3.181±0.118	0.118±0.007
Season of calving:		* *	* *	* *	* *	* *	* *
Autumn	967	0.865±0.002	0.916±0.006	0.895±0.010	0.835±0.009	2.453±0.048	0.141±0.003
Winter	147	0.860±0.015	0.913±0.012	0.865±0.017	0.840±0.015	2.708±0.074	0.140±0.004
Spring	292	0.749±0.011	0.863±0.009	0.858±0.014	0.729±0.012	2.484±0.074	0.120±0.004
Summer	391	0.817±0.010	0.904±0.008	0.905±0.012	0.803±0.010	2.584±0.055	0.125±0.003
Reg. (AGE):							
Linear							
Quad.		-0.001±0.001	-0.001±0.001	0.0001±0.001	-0.001±0.001	0.011±0.004	-0.000±0.000
		0.000±0.000	0.000±0.000	0.000±0.000	0.000±0.000	-0.000±0.000	0.000±0.000

N.S. = Not significant * = significant * * = Highly significant

The values of persistency of lactation (estimated by six methods and calculated for each record a sit were mentioned in the materials and methods), were 0.82 , 0.90 , 0.88 , 0.80 , 2.58 and 0.13 for P_1 , P_2 , P_3 , P_4 , P_5 , and P_6 respectively . Similar values were recorded by Khattab (1984) , Hussein (1991) , Badawy (1994) and Aly (1995) .

Parity had non-significant effect on values of persistency of lactation estimating by six methods. These results agreement with Khattab (1984) , Moon *et al* (1991) , Badawy (1994) and Aly (1995) .

The second lactation had the highest values by using all estimating methods of persistency .

The trend of persistency values tended decrease with advancing cows age . Some explanation lead to this fact that when the cow gets older , it is expected to start their lactation at a higher level of production , however , under the inhibitory effect of pregnancy which start to occurs at about the same stage of increasing lactation , so , the rate of decline becomes rapid in older in relation to younger cows .

Regarding the effect of calving year on persistency ; highly significant ($P< 0.01$) effect was observed for year of calving on values of persistency of lactation (Table 3) . The highest persistency values showed fluctualation by year according to the six system of calculation (table 3) .

Khattab (1984) , Badawy (1994) and Aly (1995). Reached to similar conclusion . They attributed this results to the effects of one more of changes in herd size , age of animals and different managerial practices. Season of calving had highly significant ($P< 0.01$) effect on all values of persistency except value of Ps which was only significant (Table 3) . Similar results reported by Khattab (1984) , Zamorano and villarreal (1987) and Aly (1995).

Autumn calves had the highest values of P_1 , P_2 and P_6 (0.87 , 0.92 and 0.14) , respectively , also summer calves had the highest values for P_3 (0.91) , while winter calves had the highest values for P_4 and P_5 (0.84 and 2.71) , respectively .

This means that mainly autumn as well as winter season showed their highest effects on persistency probable the explanation for this phenomena on , is that under the Egyption environmental conditions , the group of cows which starting their lactation in summer by lower level of milk production , resulted in a long lactation records coverd relatively longer period , where favorable conditions for milk production prevailed till the end of spring.

On other hand , cows calving in autumn would be expected to start their lactations at a higher level and this would lost for the next months of winter , which coverd mostly the following six months period which reflected in the effect on persistency .

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دراسات على ماشية الفريزيان فى مصر

٢- العوامل البيئية المؤثرة على إنتاج اللبن

فايق حسنى حسين فراج[١]، عادل سيد أحمد البربرى[٢] ، محمد فراج عبد الجليل[٣] ، كمال الدين حسين[٣]

١ قسم الإنتاج الحيوانى – كلية الزراعة – جامعة المنصورة

٢ قسم الإنتاج الحيوانى والسمكى – كلية الزراعة – جامعة الإسكندرية

٣ قسم تربية الحيوان – معهد بحوث الإنتاج الحيوانى – وزارة الزراعة – مصر

تم تجميع البيانات الخاصة بعدد ١٧٩٧ سجل من ٧٥٦ بقرة والتابعة لمزرعة الشاذلى فى شبرا تانا مركز بسيون محافظة الغربية خلال الفترة من ١٩٨٥ حتى ١٩٩٣ وذلك بهدف دراسة بعض العوامل البيئية المؤثرة على إنتاج اللبن .

والنتائج المتحصل عليها تتلخص فى الآتى :

1. متوسط إنتاج كل من اللبن الكلى ، إنتاج اللبن خلال ٣٠٥ يوم ، طول موسم الحليب ، إنتاج اللبن التجميعى فى ٩٠ ، ١٨٠ ، ٢٧٠ يوم بلغت ٩, ٤٧٥٦كجم ، ٨, ٤٥٦٦كجم ، ٦, ٣٠٩ يوم ، ٨, ١٥٢٥ كجم ، ٨, ٢٨٧٢كجم ، ٢, ٣٩٧٣كجم على التوالى .
2. متوسط قيم المثابرة على الحليب المقدرة بالطرق المختلفة كانت ٨٢, ، ٩, ، ٨٨, ، ٨٠, ، ٥٨, ٢ ، ١٣ على التوالى .
3. كان تأثير ترتيب موسم الحليب غير معنوى على كل الصفات موضع الدراسة فى حين كان التأثير عالى المعنوية على إنتاج اللبن التجميعى فى ٩٠ يوم الأولى من موسم الحليب .
4. تبين أن نسبة الولادة عالى المعنوية على إنتاج اللبن التجميعى فى ٩٠ ، ١٨٠ يوم الأولى من موسم الحليب وطرق المثابرة ١ ، ٢ ، ٣ ، ٤ ، ٥ ، ٦ ومعنوى على إنتاج اللبن الكلى وطول موسم الحليب وغير معنوى على إنتاج اللبن خلال ٣٠٥ يوم وإنتاج اللبن التجميعى خلال ٢٧٠ يوم .