EFFECTS OF PREVIOUS DAYS OPEN, PREVIOUS DAYS DRY AND CURRENT DAYS OPEN ON MILK PRODUCTION IN FRIESIAN COWS.

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ABSTRACT

Effects of previous days open and days dry as well as current days open on milk production during the first and later lactations were determined for 451 Friesian cows belonging to Animal Production Research Institute, Ministry of Agriculture. Two models were used for analysis of variance. Model 1. for first lactations included sire, current days open, age at calving and season of calving. Model 2. for later lactations, included the previous effects plus previous days open, previous milk yield. The milk production traits were total milk yield (TMY), milk yield 305-days (MY-305 d), and lactation period (LP), current days open had highly significant effects on all studied traits for both first and later lactations.

Differences due to previous days open were insignificant for all traits under investigation. TMY and MY-305d tended to increase with increasing days dry till the forth period (91-120 days) then slightly decreased. Previous milk yield affected significantly (P<0.01) both TMY and MY-305d.

Keywords: Dairy cattle, previous days open and days dry, current days open, total milk yield and milk yield – 305 days.

INTRODUCTION

Economic return of a dairy farm is dependent upon reproductive performance and milk production of dairy cows. Knowledge of the relationship between milk yield and days open and days dry is important for effective control of the dairy production system. Some studies found a short days open of 30 to 60 days to be optimal (Holmann et al., 1984 and Oltenacu et al., 1981). Weller and Folman (1990) stated that late conception reduced proftability and showed early breeding to be advantageous. On the other hand, other studies have demonstrated an advantage for a longer days open and days dry periods; Sadek and Freeman (1992), Funk et al. (1987) and Oltenacu et al. (1980) reported that conception at <100 days postpartum and short dry periods of <40 days depress milk yield during the subsequent lactations.

The objectives of our study were to determine the effects of previous days open, previous day dry and current days open on milk yield as well as estimate of the optimum days open and days dry period to maximize milk production.

MATERIALS AND METHODS

Data were recorded of yield and breeding for 451 Friesian cows in the herd of Sakha Farm (Kafr El-Shiekh Governorate), belonging to Animal Production Research Institute, Ministry of Agriculture, which had more than complete lactation of 58 sires over a period of 20 years from 1979-1998.

Animals were fed according to the feeding system of the Research Institute: mainly grazed on Egyptian clover (*Trifollium alexandrinum*), berseem, during October, and concentrate mixture along with wheat straw and clover hay when available during the rest of the year as related to production. Heifers were first inseminated at either 18 month of age or 350 kg body weight. Cows were initially inseminated 60-70 days postpartum. Cows were machines milked twice a day.

Data were in two files, the first file contained 451 milk production records for first lactations. These data were analyzed for the effects of sire; as random effect, as well as current days open, age of cow and season of calving as fixed effects. The second file contained 646 records for later lactations. These data were analyzed for the effect of sire; as random effect, as well as age of cow, season of calving, current days open, previous days open, previous days dry and previous milk yield as fixed effects. Current and previous days open ranged from <60 to > 180 days, previous days dry was classified into 6 categories with 30 days width. Previous days dry was classified into 6 categories ranged from <50 to> 130 days with 20 days width. Previous milk yield ranged from <1500 to>4000 kg, was divided into 7 categories with 500 kg width. Days open period was computed as the interval between the date of calving and the date of fertile insemination. Days dry was defined as the interval between the date of dry off and the date of next calving.

All abnormal milk records such as abortion or interrupted by injury or sickness and lactation length shorter than 240 days were excluded. Milk yield 305 days for cows with more than 305 days yield was standardized to 305 days yield. If the cow normally dried off before 305 days, records were considered to be 305 days yield.

Data were statistically analyzed according to the following mixed models (Harvey, 1990) PC-1 computer program.

Model 1.

$$Y_{ijke} = U + S_i + D_j + P_k + M_l + e_{ijkl}$$ Where :

Y_{ijke}: is an individual cow observation for LP, TMY and MY-305d traits.

U: is the population mean.

S_i: is the random effect of the ith sire.

D_j: is the fixed effect of jth current days open.

P_k: is the fixed effect of Kth age of cow.

M_l: is the fixed effect of Lth season of calving

e_{ijkl} : is the random error term associated with each individual observation for each trait, assumed to be normally and independently distributed with mean zero and variance of $\sigma^2 e$.

Model 2.

$$Y_{ijklmno} = U + S_i + D_j + P_k + M_l + G_m + F_n + H_0 + e_{ijklmno}$$ Where :

$Y_{ijklmno}$, U, Si, Dj, Pk, Ml and $e_{ijklmno}$ were defined above in model.

G_m: is the fixed effect of mth previous days open.

F_n: is the fixed effect of nth previous days dry.

H_0: is the fixed effect of mth previous milk yield.

RESULTS AND DISCUSSION

Current days open:

Analysis of variance for the effects of current days open L.P, TMY and 305 d MY are presented in Table 1. for first lactations and in Table 2. for later lactations. In the present study, current days open groups had highly significant effects on all traits under investigation for both first and later lactations. Results obtained in Table 3 and 4 show that all studied traits tended to increase with increasing days open during first and later lactations. Similar results were reported by Stanley and Ben (1996), Khattab and Ashmawy (1987), Bar-Anan and Soller (1979) and Smith and Legates (1962) who showed that the current days open significantly influenced milk yield and reported that 305 d MY and total milk yield increased with increasing the length of days open.

Increasing the length of days open from 91-120 days to more than 180 days resulted in increasing TMY by only 506 kg in first lactation (Table 3) and that additional days open over the period (91-120) days added an extra days to the low production part of lactation considering a fixed length of gestation period. Therefore, an open period between 91-120 days will be desired for reducing calving interval to about 12.5 to 13.5 months. Khattab and Ashmawy (1987) reported that an open period between 60 to 90 days will be desired for reducing calving interval to about 12-13 months. Therefore, they found that increasing the length of open period from 2 to 12 months resulted in increasing milk yield by only 500 kg. Holmann *et al.* (1984) recommended 12 to 13 months as an optimum calving interval. Bar-Anan and Soller (1979) indicated that cows should be mated as early as possible for maximum live production.

Table 1: Analysis of variance for L.P, TMY and My-305d. for first lactations of Friesian cows.

S.O.V.	D.F	MS		
		LP	TMY	MY-305d
Sire	57	7293**	22528888**	1315733**
Age of calving	4	2791	4233870**	3669519**
Season of calving	3	7219	717352	778867
Days open	5	233509**	9146838**	1536497**
Remainder	381	5312	684398	468482

** P<0.01
TMY= Total milk yield
LP= Lactation period
MY-305d = milk yield 305-days.

Table 2: Analysis of variance for L.P, TMY and My-305d. for later lactations of Friesian cows.

S.O.V.	D.F	MS		
		LP	TMY	MY-305d
Sire	57	5538	1800123**	963321**
Previous dry period	5	6057	2249428*	745396
Current days open	5	410282**	21479903**	327912**
Previous days open	5	14375	1260939	526762
Age at calving	5	8192	1229995	1297070*
Season of calving	3	7249	3110527*	1824299*
Previous milk yield	6	2704	8454656**	7151533**
Remainder	559	4964	938048	545990

* P<0.05 ** P<0.01 LP= Lactation period
TMY= Total milk yield MY-305d = milk yield 305-days.

Table 3: Least square means (±S.E) of L.P, TMY and MY-305d for first lactations of Friesian cows related to days open.

Days open	No.	LP	TMY	My-305d
<60	43	258.1±13.8	2369.9±184.4	2322.4±146.7
60-90	63	266.3±11.3	2274.6±160.8	2282.7±126.3
91-120	49	313.1±13.2	2659.5±178.7	2616.7±141.8
121-150	34	314.1±14.8	2583.9±193.9	2492.2±154.8
151-180	51	365.9±12.2	3102.65±169.2	2759.2±133.6
>180	211	403.9±7.6	3165.4±129.8	2599.4±98.9

Table 4: Least square means (±S.E) of L.P, TMY and MY-305d for later lactations of Friesian cows related to days open.

Current days open	No.	LP	TMY	My-305d
<60	61	252.9±9.9	2603.9±154.9	2550.2±115.7
60-90	98	274.2±8.2	2827.3±133.7	2830.5±99.1
91-120	87	297.4±8.5	3029.92±137.9	2991.1±102.4
121-150	65	317.5±9.9	3052±150.4	2922.6±112.2
151-180	62	352.3±9.9	3402.82±150.4	3104.5±115.8
>180	211	412.3±5.8	3798.9±107.4	3109.7±78.3

LP= Lactation period TMY= Total milk yield MY-305d = milk yield 305-days.

Previous days open:

Least square means of total milk yield and milk yield 305-days in the present study, tended to be nearly similar in all previous days open groups (Table 5). This indicated that the length of previous days open had no significant effect on both TMY and MY-305d (Table 2). The results obtained herein agreed with those of Stanley and Ben (1996) and Funk et al. (1987).

Previous days dry:

Results obtained in Table 6 showed that total milk yield and milk yield 305 days tended to increase with increasing days dry till the fourth period (91-110) then slightly decreased. These differences were significant (P<0.05) for

total milk yield and insignificant for milk yield 305 days. Previous dry periods of approximately 100 days gave the highest average milk production in the following lactations (Table 6). An optimal range of 50-90 days was given by Stanley and Ben (1996), Khattab and Ashmawy (1987), Dias and Allaire (1982) and Scheffer and Henderson (1972).

Table 5: Least square means (±S.E) of L.P, TMY and MY-305d for later lactations of Friesian cows related to previous days open.

Previous days open	No.	LP	TMY	My-305d
<60	69	315.9±9.8	3156.2±153.1	2976.0±116.3
60-90	91	314.4±8.5	3164.8±137.7	3010±102.3
91-120	83	300.3±8.8	2943.2±141.3	2820.5±105.1
121-150	63	306.6±9.8	2971.9±152.9	2807.5±114.1
151-180	70	339.4±9.5	3235.2±149.4	2922.8±111.4
<180	270	330.2±6.3	3243.8±112.9	2973.7±82.7

LP= Total milk yield   TMY= Total milk yield   MY-305d = milk yield 305-days.

Table 6: Least square means (±S.E) of L.P, TMY and MY-305d for later lactations of Friesian cows related to previous days dry.

Previous days dry	No.	LP	TMY	My-305d
<50	126	309.3±7.7	2865.6±128.1	2769.3±94.6
50-70	132	319.1±7.5	3062.4±126.3	2873.7±93.3
71-90	105	321.7±8.0	32.03±131.6	2996.3±97.3
91-110	65	333.9±9.6	3394.2±150.9	3049.3±112.6
111-130	50	309.6±11.5	3111.4±173.3	2919.7±124.4
<130	168	313.2±7.7	3077.8±127.7	2900.3±94.4

LP= Total milk yield   TMY= Total milk yield   MY-305d = milk yield 305-days.

Previous milk yield:

Table (7) shows that total milk yield and 305-days milk yield increased with increasing previous milk yield. Differences due to previous milk yield were highly significant for both TMY and MY-305d (Table 2) . Part of the impact of previous days open and previous days dry on the current lactation resulted from the milk yield of the previous lactation. Solutions for previous days open and days dry decreased when previous milk yield was included simultaneously as a covariable. Adjustment of milk yield for previous yield accounted for genetic and permanent environmental effects. Similar results obtained by Stanley and Ben (1996).

Table 7: Least square means (±S.E) of L.P, TMY and MY-305d for later lactations of Friesian cows related to previous milk yield.

Previous days dry	No.	LP	TMY	My-305d
<1500	46	316.5±11.6	2834.5±175.9	2684.4±132.1
1500-2000	67	306.2±9.9	2648.1±155.2	2522.5±115.9
2001-2500	110	325.2±7.7	2923.8±128.3	2709.3±94.9
2501-3000	108	315.4±7.9	2996.4±130.3	2808.6±96.4
3001-3500	102	317.5±8.1	3134.5±132.7	2932.9±98.3
3501-4000	85	323.8±9.3	3482.7±147.1	3182±109.5
> 4000	128	319.7±8.9	3814.4±142.8	3586.8±106.2

LP= Lactation period   TMY= Total milk yield   MY-305d = milk yield 305-days.

CONCLUSION

Results of this study indicate that days open and days dry<90 days resulted in decreased both total milk yield and 305-days milk yield. The mechanism by which pregnancy adversely affects milk production is not known with certainty, but it is believed to be caused by hormonal control of milk secretion as well as partition of nutrients for various biological functions. These effects may be greater during the first three months of lactation. Whereas, the cow produce the highest milk yield during the first three months of lactation season.

It is concluded from the present study that days open of 91-120 days and days dry of 91-110 days are optimal for attaining maximum production form Friesian cattle in Egypt.

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تأثير كل من فترة الأيام المفتوحة السابقة والحالية وفترة الجفاف السابقة على إنتاج اللبن فى أبقار الفريزيان.

حمدى محمد على ، سمير على إبراهيم، زينات بيومى حسن ربيع ، زينب عبده خليفه ، كمال الدين حسين

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أجريت هذه الدراسة على سجلات اللبن والتناسل لعدد ٤٥١ بقرة فريزيان والتى تم تنشئتها فى محطة التربية بسخا التابعة لمعهد بحوث الإنتاج الحيوانى خلال الفترة من ١٩٧٩ حتى ١٩٩٨.

يتلخص الهدف من البحث فى دراسة تأثير كل من الفترة المفتوحة الحالية والسابقة وفترة الجفاف على كل من إنتاج اللبن الكلى وإنتاج اللبن المعدل لــ ٣٠٥ يوم.

وأظهرت نتائج الدراسة ما يلى :

١. كان للفترة المفتوحة الحالية تأثيرا واضحا وذا دلالة معنوية عالية على كل من الصفات المدروسة فكلما زادت الفترة المفتوحة زاد كل من إنتاج اللبن الكلى وإنتاج اللبن المعدل لــ ٣٠٥ يوم.

٢. لم يكن للفترة المفتوحة السابقة أى تأثير معنوى على كل من إنتاج اللبن الكلى وإنتاج اللبن المعدل لــ ٣٠٥ يوم.

٣. كان أعلى إنتاج لمحصول اللبن عند فترة الجفاف التى يتراوح ما بين ٩٠ إلى من ١١٠ يوم وكان لفترة الجفاف تأثيرا معنويا على إنتاج اللبن الكلى بينما لم يكن لها تأثير معنوى على محصول اللبن المعدل لــ ٣٠٥ يوم.

ومن النتائج المتحصل عليها فى هذه الدراسة يمكن توضيح أنه باتباع فترة مفتوحة تتراوح ما بين ٩١-١٢٠ يوم وفترة جفاف من ٩١-١١٠ يوم يمكن الحصول على أعلى إنتاج من اللبن للأبقار الفريزيان فى مصر.