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## Reproductive Characteristics of Holstein Cattle Reared in a Private Dairy Cattle Enterprise in Aydın

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**Abstract:** The aim of this study was to investigate the reproductive performance and the factors influencing reproductive performance of Holstein cattle reared in a private dairy cattle enterprise. Over 10 years, 480 records on reproduction were analysed with the least squares technique. Mean days open, services per conception, gestation period and calving interval were  $114.5 \pm 1.7$  days,  $2.01 \pm 0.04$ ,  $278.7 \pm 0.3$  days and  $394.9 \pm 1.9$  days, respectively. The effect of the lactation number on the gestation period was statistically significant ( $P < 0.001$ ), whereas calving year and calving season had no significant effect on reproductive performance.

**Key Words:** Holstein cattle, days open, services per conception, calving interval

### Aydın'daki Özel Bir İşletmede Yetiştirilen Holştayn Sığırların Dölverimi Özellikleri

**Özet:** Bu çalışmanın amacı Aydın İli özel bir sığırcılık işletmesinde yetiştirilen Holştayn sığırlarda dölverimi özelliklerini belirlemek ve bazı faktörlerin döl verimine etkisini ortaya koymaktır. On yıllık süre içerisinde 480 dölverimi kaydı minimum kareler tekniği ile çözümlenmiştir. Ortalama servis periyodu uzunluğu, gebelik başına düşen tohumlama sayısı, gebelik süresi ve buzağılama aralığı sırasıyla  $114,5 \pm 1,7$  gün,  $2,01 \pm 0,1$  gün,  $278,7 \pm 0,3$  gün ve  $394,9 \pm 1,9$  gün olarak bulunmuştur. Laktasyon sırasının gebelik süresi üzerine etkisi istatistiksel olarak önemli ( $P < 0,001$ ) bulunurken, buzağılama yılı ve buzağılama mevsiminin dölverimi üzerine etkilerinin istatistiksel düzeyde önemli olmadığı belirlenmiştir.

**Anahtar Sözcükler:** Holştayn sığır, servis periyodu, gebelik başına düşen tohumlama sayısı, buzağılama aralığı

### Introduction

The decline in reproductive performance in cattle is a major problem in modern dairy enterprises, because maintaining high reproductive efficiency is important for the profitability of the enterprises. Many authors have reported reproductive performance characteristics such as days open, services per conception, gestation period and calving interval to be 87-148 days, 1.5-2.3, 271-278 days and 366-450 days, respectively (1-5). However, many researchers have determined that factors such as lactation number, calving year and calving season have significant effects on the reproductive performance of Holstein cattle (6-9).

The main objective of this study was to determine the effects of calving year, lactation number and calving season on reproductive traits in Holstein cattle.

### Materials and Methods

In this research, 480 reproductive records compiled from a commercial Holstein dairy cattle enterprise in Aydın were used. Cattle with a gestation period below 260 days were excluded from the final data set because of possible early birth or abortions (8). This study was carried out from 1994 to 2003. The parameters studied in this research included days open, services per conception, gestation period and calving interval. The data were analysed by the least squares technique (10) and the following mathematical model was designed to determine the effect of factors such as calving year, lactation number and calving season affecting the traits under consideration:

$$Y_{ijkl} = \mu + a_i + b_j + c_k + e_{ijkl}$$

where

$Y_{ijkl}$  = days open, services per conception, gestation period and calving interval.

$\mu$  = overall mean,

$a_i$  = effect of calving year,

$b_j$  = effect of lactation number,

$c_k$  = effect of calving season and

$e_{ijkl}$  = random error.

Comparisons among subclass means were carried out by Duncan's test in SPSS (11).

### Results

Least square means and standard errors for days open, services per conception, gestation period and calving interval of Holstein cattle raised in a commercial dairy enterprise in Aydın are given in the Table.

Calving year had no significant effect on the days open, services per conception, gestation period or calving interval. The average days open, services per conception, gestation period and calving interval were 114.5 days, 2.01, 278.7 days and 394.9 days, respectively. The

Table. Least square means and standard errors for days open, services per conception, gestation period and calving interval.

Factors	n	Days open $\bar{X} \pm S\bar{x}$	Services per conception $\bar{X} \pm S\bar{x}$	Gestation period (day) $\bar{X} \pm S\bar{x}$	Calving interval (day) $\bar{X} \pm S\bar{x}$	
Calving year	1994	40	103.4 ± 8.1	1.70 ± 0.19	279.3 ± 1.3	383.5 ± 9.7
	1995	30	109.2 ± 8.7	2.05 ± 0.20	281.9 ± 1.4	396.9 ± 10.4
	1996	30	100.6 ± 8.3	1.86 ± 0.19	280.1 ± 1.3	374.8 ± 10.2
	1997	29	108.9 ± 10.8	2.14 ± 0.25	279.1 ± 1.7	383.6 ± 12.3
	1998	26	102.4 ± 11.5	1.91 ± 0.27	279.5 ± 1.8	377.9 ± 14.4
	1999	42	108.5 ± 8.4	2.03 ± 0.20	280.9 ± 1.3	390.1 ± 8.8
	2000	55	112.3 ± 5.5	1.99 ± 0.13	278.3 ± 0.9	385.2 ± 6.1
	2001	76	122.8 ± 6.0	2.07 ± 0.14	277.0 ± 1.0	401.2 ± 7.1
	2002	72	124.2 ± 5.5	2.10 ± 0.13	277.9 ± 0.9	404.7 ± 6.0
	2003	79	115.4 ± 7.2	1.94 ± 0.17	278.9 ± 1.1	393.9 ± 8.5
F			1.28 <sup>NS</sup>	0.48 <sup>NS</sup>	1.41 <sup>NS</sup>	1.38 <sup>NS</sup>
Calving season	Spring	95	119.7 ± 4.7	2.17 ± 0.11	279.2 ± 0.8	396.9 ± 5.1
	Summer	115	109.9 ± 5.6	1.79 ± 0.13	279.7 ± 0.9	387.8 ± 6.6
	Autumn	136	105.4 ± 5.3	1.89 ± 0.12	278.9 ± 0.8	386.0 ± 6.4
	Winter	133	108.1 ± 5.5	2.04 ± 0.13	279.3 ± 0.9	385.3 ± 6.5
F			1.38 <sup>NS</sup>	1.80 <sup>NS</sup>	0.16 <sup>NS</sup>	0.84 <sup>NS</sup>
Lactation number	1	130	114.9 ± 4.8	2.10 ± 0.11	276.7 ± 0.8 <sup>c</sup>	-
	2	114	118.7 ± 4.4	2.20 ± 0.10	278.2 ± 0.7 <sup>bc</sup>	396.2 ± 4.4
	3	88	111.7 ± 5.0	1.98 ± 0.12	279.7 ± 0.8 <sup>ab</sup>	389.9 ± 5.1
	4	68	111.9 ± 5.4	1.90 ± 0.13	281.8 ± 0.9 <sup>a</sup>	393.5 ± 5.5
	5	49	105.0 ± 7.8	1.83 ± 0.18	280.5 ± 1.2 <sup>ab</sup>	384.5 ± 7.9
	6	30	101.8 ± 10.4	1.83 ± 0.24	278.7 ± 1.7 <sup>bc</sup>	380.0 ± 10.2
F			0.81 <sup>NS</sup>	1.14 <sup>NS</sup>	4.82 <sup>***</sup>	0.80 <sup>NS</sup>
General	479	114.5 ± 1.7	2.01 ± 0.3	278.7 ± 0.04	394.9 ± 1.9	

\*\*\*: P < 0.001, NS: non significant

<sup>a, b, c</sup>: Within columns means for the same factor with the same superscript are statistically nonsignificant.

longest days open (124.2 days) was recorded in 2002. Maximum services per conception over the 10 years were determined in 1997 to be 2.14. Minimum and maximum gestation periods were 277.0 and 281.9 days, in 2001 and 1995, respectively. It was determined that calving interval was between 374.8 and 404.7 days during the study.

Calving season had no significant effect on the days open, services per conception, gestation period or calving interval. However, the longest days open (119.7 days) was recorded in spring. In accordance with this finding, maximum services per conception and calving interval were also observed in spring (2.17, 396.9 days).

The effect of lactation number on the days open, services per conception and calving interval was statistically nonsignificant, while it had a significant ( $P < 0.001$ ) effect on the gestation period. Cattle in first lactation had a shorter gestation period. Although there was no statistical significance, it was determined that services per conception had a decreasing trend over the 10 year period.

## Discussion

The results of this study revealed that calving year, lactation number and calving season had no statistically significant effect on the days open in Holstein cattle. The average days open in Holstein cattle in Aydın was 114.5. This finding was in agreement with Soysal and Gökalp (3) (124.9 days), Kumlu and Akman (6) (121 days) and Balcı (8) (118.1 days). However, Pelister et al. (5), Hwa et al. (12), Klaas et al. (13) and McNamara et al. (14) reported short (87.04 days, 103.7 days, 104.6 days and 97.8 days, respectively) days opens. In contrast, Rajala-Schultz and Frazer (15) reported longer days open (148.9 days) from Ohio dairy enterprises. Poor oestrus detection efficiency was thought to be the major factor causing lengthened days open in dairy enterprises. Within this context, it has been reported that nearly half of the oestrus periods in large-scale dairy enterprises were undetected (13,14).

Services per conception were not affected by calving year, lactation number or calving season. However,

Rajala-Schultz and Frazer (15) and Ray et al. (4) reported that the effect of calving year, lactation number and calving season was statistically significant ( $P < 0.001$ ). The average services per conception in this research were 2.01. This result was consistent with studies performed by Balcı (8) (2.03) and Faust et al. (2) (2.3). However, Soysal and Gökalp (3), McNamara et al. (14) and Alejandrino et al. (16) reported that the average services per conception were 1.5, 1.6 and 1.5, respectively. It was thought that the higher services per conception may be caused by irregular breeding management practices in the enterprise.

According to the results of the study, lactation number had a statistically significant ( $P < 0.001$ ) effect on the gestation period. The average gestation period was 278.7 days. Cattle had a shorter gestation period in their first calving, in agreement with studies reported by Balcı (8) (275 days), Foote (1) (278 days) and Pelister et al. (5) (277 days) but lower than a study performed by Soysal and Gökalp (3) (271 days).

The effects of the calving year, lactation number and calving season on the calving interval were statistically nonsignificant. Ray et al. (4) reported that lactation number and calving season had a statistically significant ( $P < 0.05$  and  $P < 0.001$ , respectively) effect on the calving interval. The average calving interval was 394.9 days in this study, consistent with studies performed by Balcı (8), Ray et al. (4), Kumlu and Akman (6), Soysal and Gökalp (3), Rajala-Schultz and Frazer (15) and Alejandrino et al. (16), who reported that the calving interval in Holstein cattle ranged from 423 and 469 days. It was thought that calving interval length was significantly associated with days open and gestation period.

In conclusion, according to the results related to reproductive parameters, this enterprise is a successful dairy business. However, in terms of environmental factors, calving year and season had no significant effect on the reproductive performance of Holstein cattle in Aydın. In contrast, it was determined that gestation period was only affected by lactation number ( $P < 0.001$ ).

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