

EFFECT OF SOME FACTORS ON MILK YIELD IN HOLSTEIN COWS

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Summary: The aim of this study was to investigate the effects of lactation number, calving year and calving season on lactation duration, complete lactation milk yield, 305 days milk yield and dry period in Holstein cows reared in a private dairy farm in Aydın. Milk yield characteristics of Holstein cows such as lactation duration, complete lactation milk yield, 305 days milk yield and dry period were included in the model and means were found as 345.8 days, 7028.9 litres, 6491.8 litres and 48.8 days, respectively. It was determined that calving year had significant effect on lactation duration ($P<0.01$), complete lactation milk yield ($P<0.01$), 305 days milk yield ($P<0.05$) and dry period ($P<0.001$). Lactation number had been significantly ($P<0.001$) effected by complete lactation and 305 days milk yield. It was revealed that calving season had significant effect ($P<0.01$) on lactation duration and complete lactation milk production, while there was no significant effect on 305 days milk yield and dry period.

Keywords: Holstein cow, lactation number, milk production.

Holstein Sığırlarda Süt Verimi Üzerine Etkili Bazı Faktörler

Özet: Bu çalışmanın amacı Aydın'daki özel bir çiftlikte yetiştirilen Holstein sığırlarda laktasyon sayısı, buzağılama yılı ve mevsiminin laktasyon süresi, laktasyon süt verimi, 305 gün süt verimi ve kuruda kalma süresi üzerine etkilerini incelemektir. Holstein sığırlarda laktasyon süresi, laktasyon süt verimi, 305 gün süt verimi ve kuruda kalma süresi gibi süt verim özellikleri oluşturulan modele katılmış ve bu özelliklere ilişkin ortalama değerler sırasıyla 345.8 gün, 7028.9 litre, 6491.8 litre ve 48.8 gün olarak belirlenmiştir. Buzağılama yılının, laktasyon süresi ($P<0.01$), laktasyon süt verimi ($P<0.01$), 305 gün süt verimi ($P<0.05$) ve kuruda kalma süresi ($P<0.001$) üzerine istatistiksel olarak önemli etkileri olduğu saptanmıştır.

Çalışma sonuçları laktasyon süt verimi ve 305 gün süt veriminin laktasyon sayısından önemli oranda ($P<0.001$) etkilendiğini ortaya koymuştur. Buzağılama mevsiminin, laktasyon süresi ve laktasyon süt verimi üzerine önemli ($P<0.01$) etkileri olduğu belirlenirken, buzağılama mevsiminin 305 gün süt verimi ve kuruda kalma süresi üzerine önemli bir etkisinin olmadığı tespit edilmiştir.

Anahtar sözcükler: Holstein siğir, laktasyon sayısı, süt üretimi.

INTRODUCTION

Milk production is the most important income factor affecting the profitability of dairy cattle enterprises. Many authors reported that there were a lot of factors affecting on the milk yield characteristics in dairy enterprises^{1,4}. On this context, Sobczynska and Dymnicki⁵ reported that cows have calved for the first time before 25 months of age, have lower milk yield than those calved later. Some authors have claimed that autumn-winter seasons are best for calving for Holstein cows and the effect of calving season is related to the productivity of the herd^{2,3}. Sobczynska and Dymnicki⁵ have supported this idea especially in low productive herds, because the effect of calving month or season is even greater than high productive ones. Many others reported that calving season has significant effects on milk and fat yields to such a degree that was necessary to introduce adjustments¹. Calving year, lactation number and calving season were indicated by many researchers having effects on the milk production characteristics of Holstein cows^{2,6,7}. Kumlu and Akman⁷ also reported that the

average dry period in Holstein cows was 74.0 days.

This study was undertaken to investigate the effects of lactation number, calving year and calving season on lactation duration, complete lactating milk yield, 305 days milk yield and dry period in Holstein cows reared in a private dairy farm in Aydın.

MATERIALS and METHODS

In this study, 544 performance records compiled from Vedat Ciftci Dairy Farm in Aydın were used. Cows with lactation number up to 6 and lactation duration over 200 days were included in the final data set¹. This study was carried out between 1994-2003 years. The parameters studied in this research included 305 days milk yield, complete lactation milk yield, lactation duration and dry period. Data were analysed by the least squares technique and the following mathematical model was designed to determine the effect of factors such as calving season, lactation number and calving years affecting the traits under consideration:

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

Where, Y_{ijk} =Lactation duration, complete lactation milk yield, 305 days milk yield, dry period

μ =Overall mean, a_i =effect of lactation number, b_j =effect of calving year, c_k = effect of calving season, e_{ijk} = random error. Comparisons among subclass means were carried out by Duncan test available in SPSS

programme⁸.

RESULTS

Least square means with their standard errors for lactation duration, complete lactation milk yield, 305 days milk yield and dry period in Holstein cows reared in a private dairy cattle farm in Aydın were given in Table 1.

Table 1. Least square means and standard errors for lactation duration, complete lactation milk yield, 305 days milk yield and dry period.

Tablo 1. Laktasyon süresi, laktasyon süt verimi, 305 gün süt verimi ve kuruda kalma sürelerine ilişkin minimum kareler ortalamaları ve standart hataları.

Factor	n	Lactation duration (day) $\bar{X} \pm S_x$	Lactation duration (day) $\bar{X} \pm S_x$	Lactation duration (day) $\bar{X} \pm S_x$	Lactation duration (day) $\bar{X} \pm S_x$	
Calving year	1994	41	347.0 \pm 4.7 ^{bc}	6783 \pm 221.2 ^a	6120 \pm 183.7 ^a	42.2 \pm 2.8 ^b
	1995	31	342.6 \pm 8.8 ^b	6916 \pm 287.3 ^a	6327 \pm 236.8 ^a	42.6 \pm 3.0 ^b
	1996	34	338.2 \pm 11.8 ^b	6501 \pm 284.4 ^a	6055 \pm 209.9 ^a	44.5 \pm 3.5 ^{ab}
	1997	32	332.3 \pm 11.8 ^b	6647 \pm 252.2 ^a	6248 \pm 173.9 ^a	60.5 \pm 5.1 ^d
	1998	38	370.5 \pm 12.0 ^c	7237 \pm 264.4 ^{ab}	6471 \pm 217.7 ^{ab}	53.2 \pm 4.1 ^{bcd}
	1999	47	331.5 \pm 8.5 ^{ab}	6622 \pm 205.9 ^a	6265 \pm 169.4 ^a	56.9 \pm 2.8 ^{cd}
	2000	63	356.8 \pm 8.4 ^c	6958 \pm 192.2 ^{ab}	6398 \pm 158.3 ^{ab}	50.3 \pm 2.5 ^{abc}
	2001	92	351.9 \pm 6.4 ^{abc}	7241 \pm 198.9 ^{ab}	6646 \pm 166.5 ^{ab}	49.6 \pm 2.1 ^{abc}
	2002	83	357.1 \pm 5.6 ^c	7737 \pm 179.5 ^b	7021 \pm 156.1 ^b	49.5 \pm 2.1 ^{abc}
	2003	83	325.3 \pm 6.7 ^a	6802 \pm 208.1 ^a	6519 \pm 201.6 ^{ab}	42.0 \pm 2.3 ^a
F			3.04**	3.06**	2.36*	4.13***
Lactation number	1	153	345.5 \pm 5.2	6295 \pm 135.5 ^a	5847 \pm 112.9 ^a	47.3 \pm 1.8
	2	128	347.5 \pm 5.5	7041 \pm 145.5 ^b	6492 \pm 131.6 ^{bc}	47.0 \pm 2.1
	3	98	340.1 \pm 6.1	7408 \pm 165.9 ^{cd}	6908 \pm 146.5 ^c	48.4 \pm 2.2
	4	75	345.5 \pm 5.9	7708 \pm 168.4 ^d	6985 \pm 130.3 ^c	50.5 \pm 2.1
	5	56	354.6 \pm 8.7	7548 \pm 232.4 ^{bc}	6962 \pm 179.8 ^c	52.7 \pm 2.5
	6	34	343.6 \pm 9.3	6843 \pm 237.3 ^b	6331 \pm 195.6 ^b	52.9 \pm 3.3
F			0.44 ^{NS}	11.17***	11.82***	1.07 ^{NS}
Calving season	Spring	112	361.5 \pm 5.4 ^b	7439 \pm 138.8 ^b	6721 \pm 122.7	49.3 \pm 1.8
	Summer	128	338.5 \pm 5.7 ^a	6849 \pm 173.1 ^a	6415 \pm 152.0	44.7 \pm 1.6
	Fall	153	337.6 \pm 4.8 ^a	6884 \pm 137.3 ^a	6427 \pm 113.9	50.6 \pm 1.8
	Winter	151	348.7 \pm 4.8 ^b	7023 \pm 128.8 ^a	6452 \pm 106.9	49.9 \pm 1.9
F			4.22**	3.06*	1.21 ^{NS}	2.17 ^{NS}
General		544	345.8 \pm 2.6	7028.9 \pm 72.8	6491.8 \pm 61.9	48.8 \pm 0.9

*: P<0.05, **: P<0.01, ***: P<0.001, NS: non significant, a,b,c,d: Within columns means for the same factor with the same superscript are statistically significant

It was revealed that calving year had significant effect on lactation duration ($P<0.01$), complete lactation milk yield ($P<0.01$), 305 days milk yield ($P<0.05$) and dry period ($P<0.001$). The average lactation duration, complete lactation milk yield, 305 days milk yield and dry days were calculated as 345.8 days, 7029 litres, 6492 litres and 48.8 days, respectively. Maximum lactation duration was observed in 1998 with 370.5 days. Complete lactation milk yield was found slightly similar between 1994-1997 years. Maximum complete lactation milk yield was obtained in 2002. The longest dry period was recorded in 1997 as 60.5 days.

The effect of lactation number on lactation duration and dry period were found statistically nonsignificant. However, lactation number had significant effect ($P<0.001$) on complete lactation milk yield and 305 days milk yield. Maximum complete lactation milk yield was obtained from fourth lactating cows. Although, there was no statistically significance, an increasing trend was determined according to years for dry period.

Calving season had no significant effect on 305 days milk yield and dry period while there were statistically significance on lactation period ($P<0.01$) and complete lactation milk yield ($P<0.05$). Maximum milk yield for both complete lactation milk yield and 305 days milk yield were recorded as 7439 and 6721 litres in the spring. It was determined that the range among calving seasons for complete lactation milk yield was 590 litres. Cows calving in summer had lower values for both measures of complete lactation and 305 days milk yield because of high temperatures.

DISCUSSION

The average lactation duration (345.8 days) recorded in this study was slightly long but in agreement with other studies performed by Kumlu and Akman⁷, Balcı¹, whereas Duru and Tuncel² reported an optimum (304 days) lactation duration in Holstein cows. It was thought that this long lactation duration may be caused from mismanagement practices in the farm.

The average complete and 305 days milk yields were recorded as 7028.9 and 6491.8 litres in this study, whereas Kumlu and Akman⁷ reported these means for complete lactation and 305 days milk yield were found as 5203.0 and 5592.1 litres, respectively.

On the other hand, the average dry period (48.8 days) was found shorter than the other studies that performed

by Soysal and Gökalp⁹, Kumlu and Akman⁷ and Balcı¹. These findings supported that the importance of dry period in lactating cows was not known by this enterprise.

In this study, it was determined that calving year had mainly effect on the dry period ($P<0.001$). However, calving year had significant ($P<0.01$, $P<0.01$ and $P<0.05$, respectively) effects on the lactation duration, complete lactation and 305 days milk yield. Conversely, some studies performed by Hwa et al.¹⁰, Kumlu and Akman⁷, Duru and Tuncel², were mentioned that calving year had no significant effect on the lactation duration.

It was determined that complete lactation and 305 days milk yields had been affected by lactation number ($P<0.001$). These findings were found parallel with other studies reported by Okantah¹¹, Ray et al.³, Balcı¹, Duru and Tuncel², Kaya et al.⁶. These findings were also in agreement with other authors that showing that milk production significantly increases, but at a decreasing rate with lactation number^{12,13}.

It was revealed that milk yield characteristics were depressed by high temperatures. Inconsistent changes between seasons among lactation duration and complete milk yield resulted in significant ($P<0.01$ and $P<0.05$, respectively) seasonal effects. Zarnecki et al.¹³ reported that environmental conditions in the first 60 days of lactation had the greatest influence on the lactation milk yield. Complete milk yield was highest for cows freshening in spring and did not show the same in fall.

Evidence from this study, the most comprehensive investigation of the factors affecting lactation duration, complete lactation and 305 days milk yield and dry days in Aydın dairy cattle to date, indicates that calving year, lactation number and calving season should be considered in evaluation of dairy cows performance. Especially calvings may be adjusted to minimize the adverse effects of high temperatures.

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