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Research Article

Effects of Some Factors on Milk Yield and Components of Holstein-Friesian Cattle in England

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ABSTRACT

This study was conducted to determine the duration of lactation, lactation and 305 days milk yield, milk fat and protein percentage and somatic cell counts of Holstein-Friesian cattle selected randomly in five private farms in England and to investigate the effects of some environmental factors on these traits. Material of the study was 2514 yield records collected from Holstein-Friesian cattle between the years 1994 and 2003. In the statistical analysis of the yields, *contrast-test* of the GLM procedure in SAS programme package was used.

General average of the duration of lactation, lactation and 305 days milk yield, milk fat and protein percentage and milk somatic cell counts were 324.32 days, 7715.23 kg, 7218.62 kg, 4.028%, 3.333% and 137,948 cell/ml respectively. During the study, the farm where the animals were kept and the year in which lactation started made significant effects at $P<0.001$ level on all traits, also the turn of lactation has made a $P<0.05$ level effect on these traits except the $P<0.05$ level effect on the duration of lactation. Season had no important effect on lactation milk yield and somatic cell count in milk. However, season, like other factors made significant effects on the duration of lactation, milk fat and protein rates at a level of $P<0.001$ and on 305 days milk yield at a level $P<0.01$.

The results of this study showed that the farms achieved high levels of milk yield by providing optimal conditions. Management conditions and the use of high yielding breeders accomplished the improvement in yields in different years. Two principle factors came forward in the study and highest determining factors were observed to be the farm and turn of lactation.

Key Words: Holstein-Friesian, milk yield and components, somatic cell count.

ÖZET

Bu çalışma, İngiltere'deki rastgele seçilmiş beş ayrı özel işletmede yetiştirilen Siyah-Alaca sığırların laktasyon süreleri, gerçek ve 305 günlük süt verimleri, sütteki yağ ve protein oranları ile somatik hücre sayılarının belirlenmesi, bu verimler üzerinde bazı çevre faktörlerinin etkilerinin incelenmesi amacıyla yapılmıştır. Araştırmanın materyalini 1994-2003 yılları arasında yetiştirilen Siyah-Alaca sığırlardan elde edilen 2514 verim değeri oluşturmuştur. Siyah-Alaca sığırların verim değerlerinin istatistik analizlerinde GLM prosedüründen contrast-testi kullanılmıştır.

This study was summarized from the PhD thesis "Researches on some production traits of Holstein-Friesian cattle under private farm condition in England" of Nihal Topaloğlu.

İncelenen süt verimi özelliklerinden laktasyon süreleri, gerçek ve 305 günlük süt verimleri, sütteki yağ ve protein oranları ile somatik hücre sayısına ait genel ortalamalar 324,32 gün, 7715,23 kg, 7218,62 kg, %4,028, %3,333 ve 137.998 hücre/ml olarak belirlenmiştir. Çalışmada, etkileri araştırılan faktörlerden hayvanların yetiştirildikleri çiftliğin ve laktasyona başlanan yılın tüm özellikler üzerinde P<0,001 düzeylerinde, yine laktasyon sırasının da bu özellikler üzerinde, laktasyon süresi üzerinde P<0,05 düzeyindeki etkisi dışında, aynı düzeyde önemli bir faktör olduğu belirlenmiştir. Mevsimin ise, gerçek süt verimi ve sütteki somatik hücre sayıları üzerindeki etkisi önemsiz olarak bulunmuştur. Ancak, mevsim faktörünün diğer faktörler gibi laktasyon süresi, sütteki yağ ve protein oranları üzerinde P<0,001 ve 305 günlük süt verimi üzerinde P<0,01 düzeylerinde önemli etkisinin olduğu bulunmuştur.

Bu araştırmada elde edilen sonuçlar, işletmelerin sığır yetiştiriciliği için gerekli optimum koşulları sağlayarak yüksek düzeyde verim elde ettiklerini göstermektedir. Hayvanlara uygulanan management ve kullanılan daha yüksek verimli damızlık materyal yıllar arasında daha yüksek verime ulaşılmasını sağlamıştır. Çalışmada temel olarak iki faktör ön plana çıkmış ve en yüksek düzeyde belirleyici faktörlerin çiftlik ve laktasyon sırası olduğu belirlenmiştir.

Anahtar Kelimeler: Siyah-Alaca, süt verimi ve süt komponentleri, somatik hücre sayısı.

Introduction

Animal breeding in agricultural production is one of the most important proportions in the economy and progress of developed countries. Recent studies on animal improvement and management have increased the importance of the effect of animal breeding particularly cattle breeding on the country economy.

The first condition to increase milk yield and an economical production is to increase the yield per animal. This is possible by improving the environmental and managemental conditions and adding high yielding animals to the herd. The yielding ability of an animal is determined by its genotype and environment. In the countries where genetic improvement is achieved, selection and elimination is accomplished systematically and managed with good organisations, therefore, it is possible to use the animals more efficiently. Economy and industry of these type of countries are at high level.

England, which is one of these countries, gives a big importance to dairy cows and dairy products. Dairy products have an approximately 35% proportion in the whole agricultural economic income of the country. However, England can not cover its own milk and milk products demand by her production. For this, it is important in today's world to improve animal breeding parallel with the improvements in animal welfare. An improved animal breeding is reliable on increased genetic yielding level of animals, reproductive characteristics, improved managemental techniques and efficient economical conditions (Lamming et al., 1998).

Studies in previous years on management and genetics have improved the milk yields of cattle in England. Lactation milk yield average in England was 2500 kg in 1920, 4500 kg in 1980, 5521 kg in 1990, 6140 kg in 2000 and 6690 kg in 2003 (FAO, 2004; Lamming et al., 1998). In spite England is one of the leading cattle breeder countries, she has had great damages and economical loss in recent years from cattle diseases particularly Bovine Spongiform Encephalopathy (BSE) and Foot and Mouth Disease (DEFRA, 2004).

In cattle not only the milk yield but also quality milk production is important. It is necessary for the milk producers to keep the milk components and somatic cell counts at required levels for human and animal health. European Union Hygiene Committee stated in 1992 that milk containing 400,000 cells/ml can be used for human consumption. However, somatic cell count is accepted less then 250,000 cell/ml in most EU countries (Phillips, 2001).

It is necessary to improve the genetic potential and optimize the environmental conditions in order to increase economical efficiency in animal breeding. In the investigated traits, determination of environmental factors effect rates in individual standardisation increases the accuracy of breeder animal selection.

This study was conducted to determine duration of lactation, milk yield (lactation and

305 days), milk fat and protein and milk somatic cell counts of Holstein Friesian cattle bred in England, and to calculate the effects of some environmental factors on these yields.

Materials and Methods

The study was carried out on randomly chosen ordinary Holstein-Friesian breeding farms at southern England. The milk yield records controlled by National Milk Record were the material of the study.

Animals were kept on pasture in summer and in barns in the winter. Cows were sent to the milking herd in 2-3 days after delivery and heifers were inseminated at 320-340 kg live weight. No breeder females were added to the herd from out of the farm.

The cattle in the farms were divided into two groups as high and low yielder and were fed separately. Food substances for the animals were produced on the farms. Rations for the cattle were prepared by the owners. Milking was accomplished twice daily by automatic milkers in milking parlours. Cows were dried 2 months prior to delivery.

The study was conducted by the yield records of 5 farms between years of 1994-2003. Records were kept neatly by the ear tags of the animals which were put at their birth. Examined milk yield traits were; duration of lactation, lactation and 305 days milk yields, milk fat and protein percentages and somatic cell count. To obtain these values, monthly controls were done to lactating cows.

To calculate the lactation milk yield, the Test Interval Method of the International Committee for Animal Recording (ICAR) was employed. The milk fat and protein levels and somatic cell counts were determined by infrared analysis method (FOSS Instruments). In the determination of the 305 days milk yield of the cows, the first 305 days were taken into account of those cows with longer lactations and no correction was done to those with shorter lactations. The milk yield records of cows which were culled from the herd were not used in the study.

This study dealt with the effects of farm, turn of lactation, year and season on duration of lactation, lactation and 305 days milk yield, milk fat and protein percentage and somatic cell count in milk on some milk yield traits of Holstein-Friesian cattle in England. The following model was used for the statistical analysis of the study.

$$Y_{ijklm} = \mu + F_i + S_j + V_k + M_l + e_{ijklm}$$

The symbols in this model are:
Y_{ijklm} : Observed trait yield value of a random individual
μ : Expected mean
F_i : Farm effect (i = 1, 2, 3, 4 and 5)
S_j : Effect of the lactation turn (j = 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10)
V_k : Effect of the year (k = 1994, 1995, ... and 2003)
M_l : Effect of the season (l = winter, spring, summer and autumn)
e_{ijklm} : Random error.

In the study, to find the effect ratios of the factors showing classified variation and the ratios of environmental factors in general variation, tables of the material which were grouped in various classes were used. It was assumed that there was no significant interaction between factors under investigation and these effects of factors were determined by using least squares means method. The difference between the least squares means of effect proportions was determined statistically by using contrast-test. The data were analysed with the general linear models (GLM) procedure of the SAS programme package (Goodnight and Harvey, 1978; Searle et al., 1980).

Results

In this study, duration of lactation, lactation and 305 days milk yields general and corrected averages and effect proportions of sub-groups established according to the farm on which the animals were kept, lactation turn, year in which lactation started and season and the statistical control and determining degrees of the differences among them are presented in

Table 1. Milk fat and protein levels relating the investigated factors and somatic cell count values are presented in Table 2.

General means of the duration of lactation, lactation and 305 days milk yields of Holstein Friesian cattle were 324.34 days, 7715.23 kg and 7288.62 kg, corrected means were 318.42 days, 7076.35 kg and 6759.40 kg respectively.

The effect of all factors affecting these traits were statistically significant at P<0.001 level. The determining degree of examined factors were 6.2% for the duration of lactation, 32.2% for the milk yield in a lactation and 41.1% for 305 days milk yield.

Effect proportions of the examined factors were between -15.18 and 19.68 days on the duration of lactation, between -1085.06 kg and 1337.83 kg on milk yield and between -1167.97 kg and 1133.04 kg on 305 days milk yield.

General averages of milk fat, protein and somatic cell count were 4.028%, 3.333% and 137,998 cell/ml, corrected averages were 4.204%, 3.296% and 174,438 cell/ml, respectively.

Effect of all factors affecting milk components and somatic cell count were statistically significant at a level of P<0.001. The determining degrees of the observed factors were 12.6% for milk fat, 11.8% for milk protein and 10.8% for somatic cell count.

The effect proportion of the observed factors were between -0.182% and 0.349% on milk fat, between -0.075% and 0.073% on milk protein and between -84.476 and 70.716 cell/ml on somatic cell count.

In this study, among the factors affecting the milk yielding traits; the farm on which the animals were reared, and the year in which lactation started were statistically significant at a level of P<0.001. The turn of lactation was also a significant factor at the same level on these traits except its P<0.05 level effect on the duration of lactation. The season in which animals started lactation was not significant on lactation milk yield and milk somatic cell count. However, season factor like all the other factors had a P<0.001 level significant effect on the duration of lactation, milk fat and protein rates and a P<0.01 level significant effect on 305 days milk yield.

In the light of these evaluations; the differences among the sub-groups effects of some factors like the farm, turn of lactation, year on which lactation started and season (except the insignificant effect of season on lactation milk yield and milk somatic cell count) were statistically significant (P<0.05).

Discussion

Lactation period of the cattle in the study was 19 days longer than the standard 305 days. Shortest calving interval was in the 4th farm comparing with 389 days result in the study. Duration of lactation had variations relating the lactation turn of the cows, however there was an increase parallel with year. Cows starting lactation in summer months had longer lactation durations than the others.

In this study which was conducted on Holstein-Friesian cattle in England, the lactation milk yield showed variations relating the duration of lactations. In the Farm 4, where the duration of lactation was shortest, the lactation milk yield was also the lowest among all the farms. The lactation milk yield showed a regular increase relating to the turn of lactation, reached the highest level at the 4th lactation and decreased again significantly at 9th and 10th lactations. The lactation milk yield was observed to increase regularly according to years. However, the mean value of the last year was 48 kg less then the year before. Highest milk yield among the seasons was determined in cattle starting lactation at summer months. The lactation milk yield determined in this study was lower than the studies of Ojango and Pollot (2002) of England, Van Arendonk and Liinamo (2003) of Holland and National Agricultural Service (NASS, 2001) of U.S.A. However, it was higher than the value of English National Dairy Council (NDC, 2001).

Table 1. General and corrected averages of the lactation and 305 days milk yield, effect proportions of the observed factors, comparison among the groups significance level (*F-values*) and determining degree (R^2) of Holstein-Friesian cattle.

Tablo 1. Siyah-Alaca sığırların laktasyon süresi, gerçek ve 305 günlük süt verimlerine ait genel ve düzeltilmiş ortalamalar, incelenen faktörlerin etki payları (*EP*), gruplar arası karşılaştırmalar, önemlilik düzeyleri (*F-değeri*) ve belirleme dereceleri (R^2).

Factors	n	Lactation Duration (day)	Lactation Milk Yield (kg)	305 Days Milk Yield (kg)
Overall Means	2514	324.32±1.141	7715.23±40.971	7288.62±34.397
Expected Means	2514	318.42±1.111	7076.35±33.907	6759.40±26.535
All Factors	*F* (R^2)	6.54*** (0.062)	47.25*** (0.322)	69.39*** (0.411)
Farm	*F* (R^2)	18.96*** (0.028)	39.52*** (0.043)	57.79*** (0.055)
1	263	-0.62^{b}	-155.43^{c}	-163.62^{a}
2	396	19.68^{a}	-203.93^{c}	-370.09^{b}
3	527	-2.60^{b}	587.38^{a}	594.66^{a}
4	576	-11.89^{c}	-591.51^{d}	-433.38^{b}
5	752	-4.57^{b}	363.49^{b}	372.43^{a}
Lactation Turn	*F* (R^2)	2.00* (0.007)	44.29*** (0.109)	82.14*** (0.175)
1	722	5.80^{ab}	-1039.17^{d}	-1167.97^{f}
2	567	0.65^{bc}	-4.73^{c}	-72.41^{e}
3	420	2.71^{ab}	641.12^{ab}	547.44^{bc}
4	302	-5.56^{c}	719.28^{a}	771.04^{a}
5	200	-2.69^{bc}	623.04^{ab}	681.65^{ab}
6	126	-4.42^{bc}	200.34^{c}	300.31^{cd}
7	76	4.78^{abc}	151.37^{c}	72.99^{d}
8	50	17.13^{a}	170.27^{bc}	56.03^{de}
9	27	-13.66^{bc}	-512.24^{cd}	-324.78^{ef}
10	24	-4.74^{abc}	-949.28^{d}	-864.30^{f}
Year	*F* (R^2)	6.36*** (0.021)	40.21*** (0.099)	47.63*** (0.102)
1994	39	-15.18^{c}	-1085.06^{e}	-883.96^{e}
1995	42	-10.24^{bc}	-1067.26^{e}	-905.32^{e}
1996	65	-5.02^{bc}	-463.67^{de}	-353.03^{cd}
1997	90	-10.24^{c}	-767.42^{e}	-599.52^{de}
1998	159	-2.52^{bc}	-182.29^{d}	-179.16^{c}
1999	218	-0.77^{bc}	190.22^{c}	203.53^{b}
2000	333	3.79^{b}	250.36^{c}	254.30^{b}
2001	441	17.43^{a}	497.82^{b}	237.58^{b}
2002	522	16.35^{a}	1337.83^{a}	1092.54^{a}
2003	605	6.39^{b}	1289.47^{a}	1133.04^{a}
Season	*F* (R^2)	7.49*** (0.008)	$0.98^{N.S.}$ (0.001)	3.62** (0.003)
Winter	552	-2.82^{b}	-101.79^{a}	-34.85^{b}
Spring	285	-5.32^{b}	1.02^{a}	-86.61^{b}
Summer	378	11.75^{a}	69.18^{a}	-20.81^{b}
Autumn	1299	-3.61^{b}	31.59^{a}	142.27^{a}

^{a,b,c,d,e,f} : Differences between sub-groups with different superscripts are statistically significant (P<0.05).

*** : P<0.001, **: P<0.01, *: P<0.05, $^{N.S.}$: P>0.05

Table 2. General and corrected averages of the milk fat, protein percentages and somatic cell count, effect proportions of the observed factors, comparison among the groups, significance level (*F-values*) and determining degree (R^2) of Holstein-Friesian cattle.

Tablo 2. Siyah-Alaca sığırların sütteki yağ ve protein oranları ile somatik hücre sayılarına ait genel ve düzeltilmiş ortalamalar, incelenen faktörlerin etki payları (*EP*), gruplar arası karşılaştırmalar, önemlilik düzeyleri (*F-değeri*) ve belirleme dereceleri (R^2).

Factors	n	Milk Fat Percentage (%)	Milk Protein Percentage (%)	Somatic Cell Count ('000 cell/ml)
Overall Means	2514	4.028±0.009	3.333±0.004	137,998±4,313
Expected Means	2514	4.203±0.009	3.296±0.004	174,438±4,093
All Factors	*F* (R^2)	14.34*** (0.126)	13.126*** (0.118)	12.10*** (0.108)
Farm	*F* (R^2)	38.25*** (0.054)	44.50*** (0.063)	19.49*** (0.028)
1	263	0.118^{a}	-0.065^{c}	$39,661^{a}$
2	396	0.115^{a}	0.012^{b}	$9,790^{b}$
3	527	-0.086^{b}	0.057^{a}	$37,951^{a}$
4	576	-0.182^{c}	-0.057^{c}	$-49,013^{c}$
5	752	0.035^{d}	0.053^{a}	$-38,389^{c}$
Lactation Turn	*F* (R^2)	6.71*** (0.021)	4.18*** (0.013)	10.57*** (0.034)
1	722	-0.153^{e}	-0.038^{b}	$-84,476^{e}$
2	567	-0.110^{de}	0.017^{a}	$-71,868^{d}$
3	420	-0.088^{cd}	0.004^{a}	$-35,590^{c}$
4	302	-0.056^{bcd}	0.003^{a}	$-16,415^{bc}$
5	200	0.020^{ab}	0.023^{a}	$5,515^{ab}$
6	126	0.070^{ab}	0.005^{a}	$46,605^{a}$
7	76	0.015^{abc}	0.017^{a}	$-9,299^{abc}$
8	50	0.056^{ab}	0.009^{ab}	$64,403^{a}$
9	27	0.042^{abcd}	-0.039^{ab}	$32,030^{ab}$
10	24	0.202^{a}	-0.001^{ab}	$69,095^{a}$
Year	*F* (R^2)	13.01*** (0.041)	6.86*** (0.022)	8.17*** (0.026)
1994	39	0.349^{a}	-0.075^{c}	$-8,632^{bc}$
1995	42	0.141^{b}	-0.073^{c}	$-9,001^{bc}$
1996	65	0.088^{b}	0.009^{b}	$0,461^{bc}$
1997	90	-0.014^{bc}	-0.005^{b}	$-34,737^{c}$
1998	159	0.041^{b}	0.001^{b}	$-34,632^{c}$
1999	218	-0.148^{d}	-0.001^{bc}	$-13,477^{c}$
2000	333	-0.182^{d}	0.019^{b}	$-14,344^{c}$
2001	441	-0.050^{c}	0.030^{b}	$-1,316^{c}$
2002	522	-0.050^{c}	0.073^{a}	$44,962^{b}$
2003	605	-0.175^{d}	0.022^{b}	70.716^{a}
Season	*F* (R^2)	11.83*** (0.012)	17.72*** (0.019)	$1.01^{N.S.}$ (0.001)
Winter	552	-0.042^{c}	-0.016^{c}	$6,274^{a}$
Spring	285	-0.086^{c}	-0.051^{d}	$9,837^{a}$
Summer	378	0.097^{a}	0.054^{a}	$-7,425^{a}$
Autumn	1299	0.031^{b}	0.013^{b}	$-8,686^{a}$

$^{a, b, c, d, e}$: Differences between sub-groups with different superscripts are statistically significant ($P<0.05$).
*** : $P<0.001$, $^{N.S.}$: $P>0.05$

As it was in lactation milk yield, the 305 days milk yield in the study was also the highest in Farm 3 and at the 4th lactation. Although the lactation milk yields of cattle which started lactation in summer months were higher, the 305 days milk yield was determined higher on cattle which started lactation in the following season, autumn. The 305 days milk

yield value of the present study was higher than the values reported by Roughsedge et al. (2000) and Hovi et al. (2002) in England, Mantysaari et al. (2002) in Finland and Güneş (1996), Pelister et al. (2000) and Kaya et al. (2003) in Turkey for Holstein cattle. The results of this study was lower than the results reported by Taylor et al. (2003), Ojango and Pollott (2002), Mayne et al. (2002) in Northern Ireland, Ouweltjes (1998) in Holland and Gröhn et al. (1999) in the U.S.A.

In this study the milk fat and protein levels during the whole lactation were 4.028% and 3.333% respectively. The lactation milk yield increased with the turn of lactation and also the milk fat showed an increase. These values showed that the correlation between the milk yield and milk fat is not negative in this study. However, when the cattle were divided into groups according to years, the milk fat decreased with the increase in milk yield. The milk fat and protein rates were higher in cattle which started lactation in summer and autumn months.

There are 3 disadvantages of higher somatic cell count in milk. These are; decrease in the milk yield as a result of damaged milk producing cells, increased milk lipase rate causing a sour taste and with a decrease in milk casein rate amount of cheese production also decreases. Infectious and non-infectious factors affect the somatic cell count. Berning and Shook (1992) and Schepers et al. (1997) stated by their studies at various periods that the most important bacteria causing mastitis and increasing the somatic cell counts were *Staphylococcus aureus*, *Streptococcus spp.* (*Strep. agalactiae*, *Strep. dysgalactiae* ve *Strep. uberus*) and coliforms, than *Corynebacterium bovis* and coagulase negative staphylococci. Among the non-infectious factors the lactation turn, lactation period, milk production level, construction of the mammary lobe, breed, number of animals in the herd, season, geographical characteristics of the area, type of the building, environment and management can be taken into account (Laevens et al., 1998).

In England in order to keep the somatic cell count in milks lower than 400,000 cells/ml, some obligations have been operated to farms with higher somatic cell counts and in 1997 they have banned the milk with higher cell counts from human consumption. After these applications somatic cell count average was 180,000 cells/ml in England in 1999 (Phillips, 2001).

The milk somatic cell count of 137,998 cell/ml in the present study is quite lower then the accepted level by the European Union Hygiene Committee (Phillips, 2001). This value is also lower than the value accepted for England in 1999. The somatic cell counts were lower in the 4^{th} and 5^{th} farms where the health of the animals was handled more seriously. The somatic cell counts an increased with the lactation turn and year. This value was determined higher in older cows as it was reported by Mrode et al. (1998). At the beginning of lactation when milk fat and protein were higher, the somatic cell counts were lower. The somatic cell count in this study was similar to the values reported by Mrode et al. (1998) and Whitaker et al. (2000) in England. This value was lower then that of Hovi et al. (2002) in England, Veerkamp et al. (1998) in Scotland and Haile-Mariam et al. (2003) in Australia.

Among the factors affecting yields, the farm showed variations as a result of different management and feeding of animals. As it was expected, milk yield increased with lactation turn. The year in which lactation started, increasingly continued its effect during the 10 years on yield characters. These findings are similar to the findings of Duru and Tuncel (2002), Pelister et al. (2000), Güneş (1996) and Glover (1997). The season factor was alike the findings of Wood (1985) who reported that the cows which started lactation during autumn gave higher milk yield then the cows which started lactation during spring. However, researchers did not have an agreement on the season factor. These factors were reported important by some researchers (Duru and Tuncel, 2002; Pelister et al., 2000) and unimportant by some (Güneş, 1996).

Fundamentally two factors have protruded in the study. It was observed that the farm factor

was the highest level determining factor of the lactation duration, milk fat and protein (2.8%, 5.4% and 6.3%). Meantime, the turn of lactation was the determining factor of the lactation and 305 days milk yield and the somatic cell count (10.9%, 17.5% and 3.4%). The highest variation in the lactation and 305 days milk yields were observed in those cattle with the longest and shortest lactation periods.

When the lactation turn and the year beginning to lactation composition of the cattle in the study were examined, it was seen that there were animals beyond their 7th lactation and those having yields before 1998. The number of cattle starting lactation in autumn was obviously higher. The plan was to include all the animals in all herds, so all the previous yielding records were taken into account. Different findings can be observed if the composition of sub-groups such as lactation turn in years is examined. These variations though make some differences in the managemental deviations of the farms, are important informative agents about the general status and yielding levels of the animals.

When the milk yield and the somatic cell count in milk were evaluated according to the starting year of lactation, it was observed that the milk somatic cell count increased with the increase in milk yield. Also, older animals gave less milk yield and higher somatic cell count than expected means.

Conclusion

The lactation duration of Holstein cattle on five different farms in England was found close to the standard 305 days. The short difference was thought to be due to the late first insemination time of cattle after delivery, long open period duration and high milk yield. The lactation and 305 days milk yield values were higher then the general average of English cattle. This suggests that the examined farms have provided a better feeding and management environment to their animals. Milk fat and protein levels were higher than those reported for Holsteins. Somatic cell counts were quite lower then the level reported by international foundations. These findings reveal the high milking character of cattle together with the good health conditions on these farms.

It was determined that the environmental factors with measurable effects caused serious variations on examined yielding characteristics. The farm factor among the environmental factors affected the yielding of animals, as a result of the differences in the managements employed. Effect of the year factor was observed as the yearly increase of yields. Particularly high quality semen used for inseminations resulted with the higher yielding breeders entering the herd every year and therefore the year factor affected the yields significantly.

When the study is evaluated generally, the high yielding characteristics of the examined cattle, the optimal cattle breeding conditions and the adaptation of new applications to increase yearly yields on the examined farms are realized. The findings of the study showed that the herd management principles and cattle bred on these farms could be used as models by other breeders.

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