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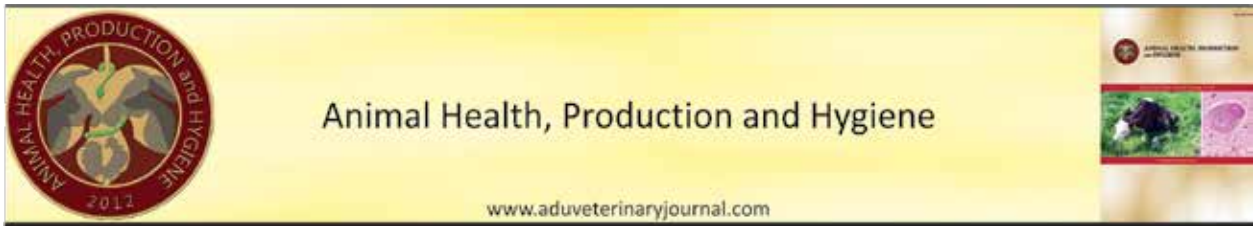


Research Article

# The Analysis of Milk Yield and Reproductive Traits of Holstein Cows Raised at a Private Dairy Farm in Bozdoğan County of Aydın, Turkey

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A B S T R A C T

The aim of this study was to analyze with special reference for performance traits of Holstein cows raised at a private dairy farm in Bozdoğan county in Aydın. The data on calving obtained from Holstein cows (n=104) for 1-6 lactations January 2009 through December 2011. Overall means of lactation milk yield (LMY), 305-day milk yield, lactation length (LL), calving interval (CI), age of first calving (AFC), dry period (DP), service period (SP) and number of insemination per conception (NIPC) were 5848 ± 172 kg, 5725 ± 149 kg, 322.2 ± 4.56 days, 403.9 ± 7.81 days, 27.3 ± 0.56 months, 58.0 ± 0.87 days, 136.9 ± 8.85 days and 1.8 ± 0.11 number, respectively. The effect of calving season ($P<0.01$) on lactation length were deemed statistically significant. The effects of lactation number and calving year ($P<0.01$) on calving interval were also presenting statistical importance. Besides the effect of calving year ($P<0.001$) and calving season ($P<0.01$) on service period and number of insemination per conception from performance traits in Holstein cows were also found statistically significant. The results of this study indicated that the environmental conditions, management and feeding practices should be improved because of lowest/highest alterations in productive and reproductive performance.

*Keywords: Holstein Cow, Milk yield, Reproductive traits*

# Aydın Bozdoğan İlçesinde Özel Bir Süt Sığırcılığı İşletmesinde Yetiştirilen Holştayn İneklerin Süt ve Döl Verimi Özelliklerinin Analizi

Ö Z E T

Bu çalışmanın amacı, Aydın Bozdoğan ilçesinde özel bir süt sığırcılığı işletmesinde yetiştirilen Holştayn ineklerin performans özelliklerinin belirli referanslarla analiz edilmesidir. Buzağılama verileri 2009 Ocak ile 2011 Aralık arasında 1-6. laktasyonlarda bulunan Holştayn ineklerden (n=104) elde edilmiştir. Laktasyon süt verimi , 305 günlük süt verimi (305-d MY), laktasyon süresi, buzağılama aralığı , ilkine buzağılama yaşı , kuru periyot , servis periyodu ve gebelik başına tohumlama sayısı 'na ait tüm ortalamalar sırasıyla, 5848 ± 172 kg, 5725 ± 149 kg. 322.2 ± 4.56 gün, 403.9 ± 7.81 gün, 27.3 ± 0.56 ay, 58.0±0.87 gün, 136.9 ± 8.85 gün ve 1.8 ± 0,11' dir. Holştayn ineklerin performans özelliklerinden laktasyon uzunluğu üzerine buzağılama mevsiminin etkisi ($P<0.01$), buzağılama aralığı üzerine ise laktasyon sayısı ve buzağılama yılının etkisi ($P<0.01$), servis periyodu ve gebelik başına tohumlama sayısı üzerine buzağılama yılının ($P<0.001$) ve buzağılama mevsiminin etkisi ($P<0.01$) istatistik bakımdan önemli bulunmuştur. Bu çalışmanın sonuçları, verim ve üreme özelliklerinde meydana gelen çok düşük/yüksek değişimlerden ötürü çevresel koşullar, sürü yönetimi ve besleme pratiklerini iyileştirilmesi gerekliliğini ortaya koymuştur.

*Anahtar Kelimeler: Holştayn inek, süt verimi, döl verimi özellikleri*

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## Introduction

The most important nourishment part of human life is milk as it is a source of high quality animal protein. Besides, the majority of milk production of animal origin is with drawn from dairy cattle (Sandhu et al., 2011). As is known, the reproductive activity of cows in dairy operations is an important factor milk production. As calving of a dairy cow increases, the amount of milk produced elevates (Tekerli and Gundogan, 2005).

Economic income of an individual cow resembles the involvement of various performance traits in addition to milk production. Special traits including age at first calving, calving interval, service and dry periods, herd life length are important factors contributing to economical incomes that are detected by management policy (Gill and Allaire, 1975).

Calving interval and service period both have important influence on the lifetime milk production and productive life of dairy cattle, therefore certainly affects the economics of the farmers (Rafique et al., 1999). The age at first calving of a dairy cow and calving intervals are suggested as primary importance for measurement of breeding efficiency (Chapman and Chasida, 1936). Thus, the calving interval should not be longer than 12 months in an attempt to lower costs and to have profitability and optimum practicable for a dairy enterprise (Tekerli and Gundogan, 2005). Service period, recognized as an elevation in the number of days among calving and conception, may be associated with diminished profitability in dairy cows. Factors that may have influence on the latter reduction are increased breeding cost elevated risk of culling and replacement costs, and diminished milk production (De Vries, 2006).

In the lactation cycle of a dairy cow, the dry period is a crucial phase. Dairy managers dry off pregnant cows in an attempt to effectuate an appropriate length of a dry period that will maximize the productivity for the next lactation. Herd average milk production should be correlated to the average dry period duration (Dingwell et al., 2001). Optimal dry period length may vary depending lactation number, calving interval, level of milk production, etc. Researcher assessment the DP necessity in dairy cows suggests that a optimal DP is 2-month and that a DP 40 days results in diminished milk yields in succeeding lactation (Soleimani et al., 2010).

Aydın city involving Bozdoğan county, is among 1st degree improved cities in our country. Besides modern dairy farming has been performed herein within 48.1% of the population is residing in urban areas. Furthermore among active human population 62.6% is employed in urban areas. Small scale cattle farms are such as recognized as enterprises involving 1-50 animals in Bozdoğan county, albeit there are 489 small sized family proprietors involving 1-5 cattle. Bozdoğan, a county that has a substantial livestock potential of Aydın, is widely carrying out dairy cattle breeding activities and there is 28 765 head cattle population (mostly Holstein breed) (Anonymous, 2012).

The results of previous studies with special reference on reproductive and productive traits of Holstein cows were given in Table 1. The present study was performed for determining situation analysis of reproductive and productive performance of Holstein cows raised at a private dairy farm in Bozdoğan county in Aydın, Turkey.

## Materials and Methods

The study was carried out at a private dairy farm of the Bozdoğan county of Aydın, Turkey. The lactation records (1-6) of 104 Holstein cows raised between January 2009 and December 2011 were used in this study. The cows were housed in free stall barns and were milked twice a day with automatic milking machine and stationary scales with milk sampling probes. The amount of milk obtained from each cow per day was recorded on the basis of an individual record (morning and evening milking samples). For all of the involved dairy cows feeding system included corn, birdsfoot trefoil, wheat straw, barley, oat as fodder plants. In case of scarcity of green fodder, cows were fed dry roughages (corn and wheat straw).

Reproductive and milk production performance of Holstein cows were investigated in this study. The reproductive traits included age at first calving (AFC), calving interval (CI), service period (SP) and number of insemination per conception (NIPC). Milk production traits included lactation milk yield (LMY), 305-day milk yield (305-d MY), lactation length (LL) and dry period (DP).

The lactation milk yield was calculated by Dutch methods. The data were grouped according to the calving year as 1(2009), 2(2010), 3(2011), according to calving season as spring (April, May, June), summer (July, August, September), fall (October, November, December), winter (January, February, March). The possible effects on investigated production traits were determined.

Data were analyzed by ANOVA using the General Linear Model (GLM) procedure of Minitab package program (Anonymous, 2010). The statistical model used for the analysis is as follows:

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

where, Yijkl is the individual observation, μ is the expected mean, ai is the effect of lactation number (i = 1,.., 6), bj is the effect of calving year (j = 1, 2, 3), ck is the effect of calving season (k=1, 2, 3, 4), eijkl is the random error. The differences between subclass means were determined by Duncan's multiple range test (Steel and Torrie, 1984).

## Results

*Milk Production Traits*

Least square means and standard errors of milk production traits of Holstein cows were given in Table 2. The overall mean of LMY was 5848±172 kg. The highest and the lowest values of LMY were observed in Holstein cows during 4th and 1st lactations, respectively. It was determined that lactation number, calving season and

**Table 1.** The mean values obtained in previous studies for reproductive and productive traits of Holstein-Friesian Cows.
**Tablo 1.** Holştayn ineklerde üreme ve verim özelliklerine ait ortalama verilerle ilgili önceden yapılmış çalışmalar.

| References | Traits | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 305-d MY (kg) | LMY (kg) | AFC (months/days) | CI (days) | SP (days) | NIPC (no.) | LL (days) | DP (days) |
| Akman and Kumlu, 1999 | 5592 | | 28.4 months | 401 | 121 | | 331 | 74.0 |
| Ozcelik and Arpacik, 2000 | 4653.9-5520.6 | | | 364.9-396.5 | 98.4-114.6 | 1.7-2.1 | 279.6-296.8 | 78.6-107.0 |
| Akman et al., 2001 | 4564.8 | 4925.8 | 30.6 months | 388.5 | 110.2 | | 322.6 | 73.7 |
| Duru and Tuncel, 2002 | 4784 | 4966 | | | | | 304.4 | |
| Sekerden, 2002 | 5085.5 | | | 381.5 | 112.0 | | | |
| Kaya et al., 2003 | 6232 | 6829 | 28.2 months | | 138.0 | | 336 | 78.3 |
| Bakir and Cetin, 2003 | 6208.4 | 6427.9 | 892.1 days | 394 | 103.3 | | | |
| Ozcakir and Bakir, 2003 | 6170.8 | 6311.6 | | | | | 311.0 | 68.0 |
| Duru and Tuncel, 2004 | 4090-5302.7 | 4095-5800 | 23-29 months | | 40-140 | | 260.6-378.1 | 40-90 |
| Ulutas et al., 2004 | 4171 | | | 398 | | | | |
| Bilgic and Alic, 2005 | 4597.3 | 4859.4 | | | | | 284.7 | |
| Sattar et al., 2005 | | 2772.7 | 987.8 days | 505.0 | 222.2 | 3.0 | 291.8 | 224.9 |
| Sehar and Ozbeyaz, 2005 | | 6400.3 | 830.6 days | 389.3 | 109.7 | 1.6 | 297 | 74.0 |
| Tekerli and Gundogan, 2005 | | 6404.7 | | 418.8 | | | | |
| Turkyilmaz et al., 2005 | 6491.8 | 7028.9 | | | | | 345.8 | 48.8 |
| Gader et al., 2007 | | 3475.5 | 29.7 months | 433.1 | 167.7 | | 294.1 | 164.0 |
| Erdem et al., 2007 | 6141.8-7204.2 | 6118.4-7113.1 | | | | | 289.9-345.8 | 63.7-91.9 |
| Kocak et al., 2007 | | 7704.2 | 826.2 days | 401.8 | 100.6 | | 325.6 | 86.9 |
| Ozkok and Ugur, 2007 | 6729.2 | 7160.6 | 845.8 days | | 125.6 | | 330.3 | |
| Tuna et al., 2007 | | | 844.5 days | 407.0 | | | | |
| Akkas, 2007 | 5735.6 | | 842.7 days | 398.4 | 124.3 | | 330.4 | 81.2 |
| Durnali, 2008 | | 6937.6 | 855.4 days | 382.3 | 110.5 | 1.7 | 320.5 | 69.5 |
| Kocak et al, 2008 | | 5969.7 | 869.0 days | 437.5 | | | | |
| Kopuzlu et al., 2008 | | | 936.7 days | 402.4 | 119.9 | | | |
| Parlak, 2008 | 6884.1 | | 26.1 months | 424.8 | 146.5 | 1.3 | 358.5 | 66.6 |
| Rahman and Alemam, 2008 | | 4605.5 | 29.8 months | 433.1 | | | 322.1 | 90 |
| Bakir et al., 2009 | 6810.1 | 7574.3 | | | | | | |
| Cilek, 2009 | | | | 427.8 | 111.5 | 1.7 | | |
| Bayril and Yilmaz, 2010 | 7460.5 | 7518.9 | 804.9 days | 379.2 | 99.7 | 1.4 | | |
| Sahin and Ulutas, 2010 | 6976.1 | 7473.4 | 823.9 days | 411.2 | 135.8 | | | |
| Amasaib et al., 2011 | | 2026-3669 | 18.7-42.8 | 384-389 | | 2.0-4.4 | 196-293 | 121-143 |
| Irshad et al., 2011 | | 3992.4 | 912 days | 409.1 | 133.7 | 2.8 | 320.1 | 113.1 |
| Cetin and Koc, 2011 | 6748.6 | 7241.8 | | | | | 328.3 | |
| Robles et al., 2011 | | | | 390.7 | 100.5 | | | |
| Sandhu et al., 2011 | | 3977.7 | 894.7 days | 408.0 | 129.9 | 2.8 | 314.19 | |
| Sahin and Ulutas, 2011 | 6055.9 | 6425.0 | 808.1 days | 403.2 | 135.0 | 1.5 | 319.4 | 84.8 |
| Gurses and Bayraktar, 2012 | 7395.3 | | 809.3 days | 395.8 | 127.4 | | | |
| Rehman and Khan, 2012 | 1530.5 | 1552.1 | | 438 | 151 | | 235 | 218.0 |
| Usman et al., 2012 | | 3438.0 | | | | | 366.5 | 100.2 |

305-d my: 305-day milk yield, LMY: Lactation milk yield, AFC: Age at first calving, CI: Calving interval, SP: Service period, NIPC: Number of insemination per conception, LL: Lactation length, DP: Dry period.

calving year had no significant effect on LMY (P>0.05). The overall mean of 305-d MY was 5725±149 kg. The effects of lactation number, calving season and calving year on 305-d MY were not statistically nonsignificant (P>0.05). The LL was determined as 322.2±4.56 days. The highest LL was observed in 3rd lactation, while the lowest was found 1st lactation. It was determined that lactation number and calving year had no significant effect on LL (P>0.05). The effect of calving season on LL was significant (P<0.01). The highest mean value of this trait was obtained in spring, whereas the lowest mean value was in fall. The overall mean of DP was 58.0±0.87days. It was determined that lactation number, calving year and calving season had non-significant effect on DP (P>0.05).

*Reproductive Traits*

Least square means and standard errors of reproductive traits of Holstein cows were given in Table 3. The overall

**Table 2.** Least squares means and standard errors of milk production traits in Holstein cows.
**Tablo 2.** Holştayn ineklerin süt verim özelliklerine ait en küçük kareler ortalamaları ve standart hataları.

| Factors | N | LMY (kg) | 305-d MY (kg) | LL (days) | DP (days) |
|---|---|---|---|---|---|
| Lactation Number | | NS | NS | NS | NS |
| 1 | 36 | 5408±315 | 5438±288 | 308.7±7.86 | 58.8±1.81 |
| 2 | 27 | 5639±256 | 5489±223 | 325.7±8.71 | 58.2±1.17 |
| 3 | 20 | 6266±407 | 6028±364 | 336.7±9.16 | 59.8±1.28 |
| 4 | 14 | 6901±494 | 6579±321 | 330.6±13.90 | 53.5±3.35 |
| 5 | 4 | 5636±930 | 5579±956 | 326.3±27.60 | 59.0±0.70 |
| 6 | 3 | 5585±375 | 5487±285 | 313.0±22.50 | 54.6±4.37 |
| Calving Year | | NS | NS | NS | NS |
| 1 | 6 | 7327±778 | 6952±503 | 336.5±28.90 | 63.0±2.92 |
| 2 | 75 | 5830±202 | 5671±171 | 325.4±5.20 | 57.9±1.13 |
| 3 | 23 | 5522±334 | 5581±337 | 308.2±9.02 | 57.0±1.23 |
| Calving Season | | NS | NS | ** | NS |
| Spring | 20 | 6282±393 | 5976±324 | $342.4^{a}$±10.70 | 56.9±2.04 |
| Summer | 32 | 5606±327 | 5351±276 | $328.8^{ab}$±7.81 | 58.0±1.97 |
| Fall | 31 | 5740±283 | 5895±242 | $301.7^{b}$±7.16 | 58.7±1.39 |
| Winter | 21 | 5962±413 | 5805±377 | $323.4^{ab}$±10.80 | 57.9±1.54 |
| Overall | 104 | 5848±172 | 5725±149 | 322.2±4.56 | 58.0±0.87 |

*P<0.05, ** P<0.01, *** P<0.001, NS: Non significant
a,b,c,d: Least square means on the same column within each factor, followed by the different letter are significantly different (P<0.05).
LMY: Lactation milk yield, 305-d MY: 305-day milk yield, LL: Lactation length, DP: Dry period

mean of AFC was 27.3±0.56 months. It was determined that lactation number, calving year and calving season had no significant effect on AFC (P>0.05). The overall mean of CI was 403.9±7.81 days. The effects of lactation number and calving year on CI were statistically significant (P<0.01). When the data were grouped according to lactation number, the longest (456.7±29.70) and shortest (356.3±18.0) CI were determined during $6^{th}$ and $5^{th}$ lactation, respectively (Table 3). The SP was determined as 136.9±8.85 days. The longest (177.7±28.0) and shortest (91.8±9.50) SP were determined during spring and fall season, respectively (Table 3). Lactation number had no significant effect on SP (P>0.05). The SP in 2009 (calving year 1) was significantly longer compared to others (P<0.001). The overall mean of NIPC was 1.8±0.11. It was determined that lactation number had non-significant effect on NIPC (P>0.05), whereas the effects of calving year (P<0.001) and calving season (P<0.05) on this trait were statistically significant.

## Discussion

*Milk Production Traits*

Least squares mean of LMY in the present study was found as 5848 kg. This value was higher than those reported for Holsteins in some studies (Akman et al,. 2001, Duru and Tuncel, 2002, Duru and Tuncel, 2004, Bilgic and Alic, 2005, Sattar et al., 2005, Gader et al., 2007, Rahman and Alemam, 2008, Amasaib et al., 2011, Irshad et al., 2011, Sandhu et al., 2011, Rehman and Khan, 2012, Usman et al., 2012), whereas was lower than those reported by some researchers (Kaya et al., 2003, Bakir and Cetin, 2003, Ozcakir and Bakir, 2003, Sehar and Ozbeyaz, 2005, Tekerli and Gundogan, 2005, Turkyilmaz et al., 2005, Erdem et al., 2007, Kocak et al., 2007, Ozkok and Ugur, 2007, Durnali, 2008, Kocak et al., 2008, Bakir et al., 2009, Bayril and Yilmaz, 2010, Sahin and Ulutas, 2010, Cetin and Koc, 2011, Sahin and Ulutas, 2011). It is most possible that these differences could be related to management and feeding conditions in farms.

The 305-d MY determined in this study (5725 kg) was higher than those reported by some researchers (Akman and Kumlu, 1999, Ozcelik and Arpacik, 2000, Akman et al., 2001, Duru and Tuncel, 2002, Sekerden, 2002, Duru and Tuncel, 2004, Ulutas et al., 2004, Bilgic and Alic, 2005, Rehman and Khan, 2012), whereas it was lower than those reported by some researchers (Kaya et al., 2003, Bakir and Cetin, 2003, Ozcakir and Bakir, 2003, Turkyilmaz et al., 2005, Erdem et al., 2007, Ozkok and Ugur, 2007, Parlak, 2008, Bakir et al., 2009, Bayril and Yilmaz, 2010, Sahin and Ulutas, 2010, Cetin and Koc, 2011, Sahin and Ulutas, 2011, Gurses and Bayraktar, 2012). However, this value was consistent with the finding of Akkas (2007). The effects of investigated factors (lactation number, calving year and calving season) on LMY and 305-d MY were statistically insignificant (P>0.05). It has been reported that heat stress in summer season generally reduces milk production (Gaafar, 2011). However, in this study, the effect of calving season on LMY and 305-d MY was statistically insignificant. This situation could be explained that the most of dairy farms in Bozdoğan used summer sprinklers and thus, heat stress on animals could

**Table 3.** Least squares means and standard errors of reproductive traits in Holstein-Friesian Cows.
**Tablo 3.** Holştayn ineklerin döl verimi özelliklerine ait en küçük kareler ortalamaları ve standart hataları.

| Factors | N | AFC (months) | CI (days) | SP (days) | NIPC (no.) |
|---|---|---|---|---|---|
| Lactation number | | NS | ** | NS | NS |
| 1 | 36 | 25.8±0.44 | $368.4^{bc}$±11.0 | 126.7±18.40 | 1.6±0.19 |
| 2 | 27 | 27.4±0.83 | $412.4^{abc}$±17.40 | 144.6±16.10 | 1.9±0.27 |
| 3 | 20 | 27.3±1.50 | $439.9^{ab}$±16.90 | 148.3±18.80 | 1.8±0.20 |
| 4 | 14 | 31.2±2.90 | $430.1^{ab}$±19.60 | 151.5±18.80 | 2.1±0.29 |
| 5 | 4 | 27.2±0.75 | $356.3^{b}$±18.0 | 107.3±27.80 | 2.2±0.62 |
| 6 | 3 | 26.3±1.67 | $456.7^{a}$±29.70 | 86.0±14.60 | 1.6±0.66 |
| Calving Year | | NS | ** | *** | *** |
| 1 | 6 | 28.6±3.02 | $487.5^{a}$±22.60 | $313.8^{a}$±66.50 | $4.0^{a}$±0.93 |
| 2 | 75 | 27.6±0.72 | $409.2^{b}$±9.45 | $127.2^{b}$±7.94 | $1.8^{b}$±0.11 |
| 3 | 23 | 26.1±0.61 | $364.9^{b}$±11.20 | $122.2^{b}$±17.6 | $1.2^{b}$±0.14 |
| Calving Season | | NS | NS | ** | * |
| Spring | 20 | 25.3±0.50 | 403.9±21.0 | $177.7^{a}$±28.0 | $2.4^{a}$±0.33 |
| Summer | 32 | 29.0±1.43 | 413.3±12.90 | $138.1^{ab}$±12.10 | $1.9^{ab}$±0.21 |
| Fall | 31 | 27.3±1.01 | 400.7±15.80 | $91.8^{b}$±9.50 | $1.4^{b}$±0.13 |
| Winter | 21 | 26.5±0.67 | 394.7±13.90 | $162.9^{a}$±21.90 | $1.6^{a}$±0.24 |
| Overall 104 | | 27.3±0.56 | 403.9±7.81 | 136.9±8.85 | 1.8±0.11 |

*P<0.05, ** P<0.01, *** P<0.001, NS: Non-significant

a,b,c,d: Least square means on the same column within each factor, followed by the different letter are significantly different (P<0.05).
AFC: Age of first calving, CI: Calving interval, SP: Service period, NIPC: Number of insemination per conception

be minimized and prevent decrease in milk production.

In the current study, average LL was 322.2 days. This value was higher than standard LL (305 days). This situation might be due to missing heat, failure timely insemination and repeat breeding. The mean value of the LL determined in the present study was higher than those reported in many studies (Ozcelik and Arpacik, 2000, Duru and Tuncel, 2002, Ozcakir and Bakir, 2003, Duru and Tuncel, 2004, Bilgic and Alic, 2005, Sattar et al., 2005, Sehar and Ozbeyaz, 2005, Gader et al., 2007, Erdem et al., 2007, Amasaib et al., 2011, Sandhu et al., 2011, Sahin and Ulutas, 2011, Rehman and Khan, 2012). However, this value was similar to those reported by some researchers (Akman et al., 2001, Durnali, 2008, Rahman and Alemam, 2008, Irshad et al., 2011), but was lower than findings of some researchers (Akman and Kumlu, 1999, Kaya et al., 2003, Duru and Tuncel, 2004, Turkyilmaz et al., 2005, Erdem et al., 2007, Kocak et al., 2007, Ozkok and Ugur, 2007, Akkas, 2007, Parlak, 2008, Cetin and Koc, 2011, Usman et al., 2012). The effects of lactation number and calving year on LL were not statistically significant. However, calving season had significant effect on this trait. The cows calving in spring had the longest LL, while the cows calving in fall had the shortest LL.

The means of DP (58 days) determined in this study was the close to the suggested value (60 days) for dairy cattle. However, this value was lower than those findings of many researchers (Akman and Kumlu, 1999, Ozcelik and Arpacik, 2000, Akman et al., 2001, Kaya et al., 2003, Ozcakir and Bakir, 2003, Duru and Tuncel, 2004, Sattar et al., 2005, Sehar and Ozbeyaz, 2005, Gader et al., 2007, Erdem et al., 2007, Kocak et al., 2007, Akkas, 2007, Durnali, 2008, Parlak, 2008, Rahman and Alemam, 2008, Amasaib et al., 2011, Irshad et al., 2011, Sahin and Ulutas, 2011, Rehman and Khan, 2012, Usman et al., 2012). The differences between studies can be attributed to the management conditions in the farms in which the studies carried out. The effects of investigated factors on these traits were not statistically significant.

*Reproductive Traits*

Least square mean of the AFC was found as 27.3 months. This result was in agreement with the results of several researchers (Sahin and Ulutas, 2011, Gurses and Bayraktar, 2012).However, this value was higher than findings of some researchers (Duru and Tuncel, 2004, Parlak, 2008, Bayril and Yilmaz, 2010, Amasaib et al., 2011); was lower than those reported by some researchers (Akman and Kumlu, 1999, Akman et al., 2001, Kaya et al., 2003, Bakir and Cetin, 2003, Duru and Tuncel, 2004, Sattar et al., 2005, Sehar and Ozbeyaz, 2005, Gader et al., 2007, Kocak et al., 2007, Ozkok and Ugur, 2007, Tuna et al., 2007, Akkas, 2007, Durnali, 2008, Kocak et al., 2008, Kopuzlu et al., 2008, Rahman and Alemam, 2008, Sahin and Ulutas, 2010, Amasaib et al., 2011, Irshad et al., 2011, Sandhu et al., 2011). These differences the most probably may be due to management and environmental conditions.

In the current study, the CI was found higher level than

ideal value (365-395 days) and those reported by many researchers (Ozcelik and Arpacik, 2000, Akman et al., 2001, Sekerden, 2002, Bakir and Cetin, 2003, Ulutas et al., 2004, Sehar and Ozbeyaz, 2005, Akkas, 2007, Durnali, 2008, Bayril and Yilmaz, 2010, Amasaib et al., 2011, Robles et al., 2011, Gurses and Bayraktar, 2012). However, this value was similar to those reported by some researchers (Akman and Kumlu, 1999, Kocak et al., 2007, Kopuzlu et al.,2008, Sahin and Ulutas, 2011), but was lower than those reported by some researchers (Sattar et al., 2005, Tekerli and Gundogan, 2005, Gader et al., 2007, Tuna et al., 2007, Kocak et al., 2008, Parlak, 2008, Rahman and Alemam, 2008, Cilek, 2009, Sahin and Ulutas, 2010, Irshad et al., 2011, Sandhu et al., 2011, Rehman and Khan, 2012). The latter obtained value (403.9 days) suggested that the present dairy farm was out of targetting achievement of a calf per cow in a year and to those of herd management was out of the standarts. The effects of lactation number and calving year on CI were found statistically significant ($P<0.01$). The differences between the studies in terms of CI could be attributed to the genetic potential of cattle, management and feeding conditions and other factors like sex of calf, placenta expulsion time, uterine pathology (Rahman and Alemam, 2008). The effects of lactation number and calving year on CI was statistically significant ($P<0.01$). The highest CI was obtained for the cows at 6$^{th}$ lactation number (Table 3). This situation could be related to the differences of the number of animal in the groups. In this research the highest CI was obtained in 2009 (calving year 1), whereas the lowest CI was in 2011 (calving year 3). The reasons for this decrease in CI according to calving years could be improvement in management conditions in the farm and the use of bulls having high genetic potential.

Least square means of the SP changed between 86.0 and 313.8 days. The mean value of SP determined in the present study was consistent with the results of some researchers (Sahin and Ulutas, 2010, Sahin and Ulutas, 2011). However, this value was higher than those reported by some researchers (Akman and Kumlu, 1999, Ozcelik and Arpacik, 2000, Akman et al., 2001, Sekerden, 2002, Bakir and Cetin, 2003, Duru and Tuncel, 2004, Sehar and Ozbeyaz, 2005, Kocak et al., 2007, Ozkok and Ugur, 2007, Akkas, 2007, Durnali, 2008, Kopuzlu et al., 2008, Cilek, 2009, Bayril and Yilmaz, 2010, Irshad et al., 2011, Robles et al., 2011, Gurses and Bayraktar, 2012); was lower than those reported by some researchers (Kaya et al., 2003, Duru and Tuncel, 2004, Sattar et al., 2005, Gader et al., 2007, Parlak, 2008, Rehman and Khan, 2012). The differences between researches in terms of SP might be related to management and environment variations and fertility of breeding cows (Sandhu et al., 2011). In this study, calving year and calving season had significantly effect on SP. The longest SP was obtained for the cows calving in 2009 and spring season. Similarly, Ozcelik and Arpacik (1996) also reported that SP was significantly longer in spring and summer seasons compared to autumn and winter in Holstein cows.

In this study, the effects of calving year ($P<0.001$) and calving season ($P<0.05$) on NIPC were found statistically significant. Rahman and Alemam (2008) reported that significantly effect of herd, season, placenta expulsion time, lactation length and milk yield on NIPC. The differences between NIPC according to calving year and season might be due to management, environmental conditions and fertility status of cows. The NIPC found in the present study was higher than the results of some researchers (Ozcelik and Arpacik, 2000, Sehar and Ozbeyaz, 2005, Durnali, 2008, Parlak, 2008, Cilek, 2009, Bayril and Yilmaz, 2010, Sahin and Ulutas, 2011) but was lower than those reported by some researchers (Ozcelik and Arpacik, 2000, Sattar et al., 2005, Amasaib et al., 2011, Irshad et al., 2011, Sandhu et al., 2011).

## Conclusion

Holstein is a breed that it is well known high adaptation capability. Therefore, it is frequently raised in most of the dairy farm in Turkey. The LL in Holstein cows was affected by calving season. The CI was affected by lactation number and calving year. SP and NIPC were affected by calving year and calving season. The observed differences in milk yield and reproductive traits might be due to incorrect feeding, management practice and insemination techniques, climatic conditions and heat stress, fertility status of breeding cows, placenta expulsion time and uterine pathology and other factors. According these results, we concluded that it should be improved animal welfare, management and environmental conditions at this farm in Bozdoğan. which the present study was carried.

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