Journal of Animal and Veterinary Advances 8 (11): 2369-2374, 2009
ISSN: 1680-5593


# Milk Yield Traits of Holstein Cattle Reared at Tahirova State Farm in Balikesir Province in Turkey

[1]Galip Bakir, [2]Ali Kaygisiz and [3]Süleyman Çilek
[1]Department of Animal Breeding, Faculty of Agriculture,
Yüzüncü Yil University, Van, Turkey
[2]Department of Animal Breeding, Faculty of Agriculture,
Kahramanmaras Sütçü Imam University, Kahramanmaras, Turkey
[3]Department of Animal Breeding, Faculty of Veterinary Medicine,
Kirikkale University, Yahsihan, 71451 Kirikkale, Turkey

**Abstract:** In this study, effects of environmental factors on milk yield and milk yield characteristics of Holstein cows raised at Tahirova state farm in Balikesir province of Turkey have been investigated. A total of 1302 milk records obtained between 2000 and 2007 were used in this study. As milk yield traits, lactation duration, lactation milk yield, 305 days milk yield and dry period were investigated. Effect of environmental factors on milk yield traits was analyzed by using the least square means method. The least square means for the lactation duration, lactation milk yield, 305 days milk and dry period yield were 331.74±1.55 days, 7574.39±55.22 kg, 6810.14±56.38 kg and 79.47±0.90 days, respectively. The effects of calving year on lactation duration, lactation milk yield, 305 days milk yield and dry period were much significant ($p<0.01$). Effect of calving season on lactation duration was significant ($p<0.05$). Effect calving age on lactation duration and lactation milk yield was significant ($p<0.05$, $p<0.01$). The effects parity on lactation duration, lactation milk yield, 305 days milk yield and dry period were significant ($p<0.01$-$0.05$). It can be said that Holstein cattle have quite well milk yield and are raised successfully on Tahirova state farm and under conditions of west Anatolia in Turkey. To obtain much higher milk yield in this farm, true selection for milk yield should be done and better feeding, care and management should be done.

**Key words:** Holstein, cattle, milk yield, effective factors, Turkey

## INTRODUCTION

Basis aim of dairy cattle breeding is to obtain the highest yield more economically, like other livestock animal species. Yield level is determined by two components, which are genetic structure and environmental conditions. As maximum milk yield can be obtained from cows, these two basis components should take into consideration together. As all countries of world, dairy cattle's breeding in animal production of Turkey is the most important branch of animal production and decreasing of economic loss is accepted as obligatory to increase the milk yield level per cow. Especially in last years, improvements have done considerably in dairy cattle breeding in all regions in Turkey (Kutlu *et al*., 2003; Akman *et al*., 2005).

Ratio of native cattle breeds (Anatolian black breed, East Anatolian red breed, Southern Anatolian red breed and Turkish grey and other breeds) are constituted 34.52% of cattle population of Turkey. Ratio of crossbred cattle is constituted 43.11% of cattle population of Turkey and culture breed cattle as Holstein, Simmental, brown Swiss and other breeds is 22.37% of cattle population of Turkey (Anonymous, 2006). Crossbred of Holstein cattle with native breeds in Turkey are named Turkish black pied (Pelister *et al*., 2000). In Turkey, ratios of culture breed cattle have increased gradually in last years. However, total milk production in Turkey has been increased.

Black pied or Holstein cattle are at more number as numerically among culture-breed cattle reared in Turkey. However, as other breeds, milk yield level of Holstein cattle is affected by genetic structure and also more significantly environmental condition. As a result, yield levels are various in different regions and different farm condition of Turkey. These various demonstrate partially different of milk yield level of regions and farms in subject of dairy cattle breeding (Kutlu *et al*., 2003; Erdem *et al*., 2007).

**Corresponding Author:** Süleyman Çilek, Department of Animal Breeding, Faculty of Veterinary Medicine, Kirikkale University, Yahsihan, 71451 Kirikkale, Turkey

Table 1: Results for milk yield researches which were done in different state farms in Turkey

| Region of research | Lactation duration (day) | Lactation milk yield (kg) | 305 days milk yield (kg) | Dry period (day) | References |
|---|---|---|---|---|---|
| Yalova | 290.7 | 3935.8 | 3902.5 | 75.5 | Tuncel and Eker (1972) |
| Sakarya | 305± 2.2 | 2801±39.9 | 2766 | - | Çetegen (1978) |
| Polatli | 295.9 | 3459 | - | 75.1 | Sekerden and Pekel (1981) |
| Malya | - | - | 3102.52±63.52 | 114.22±10.2 | Cengiz (1982) |
| Koças | - | - | 3039.99±35.83 | 75.51±3.42 | Cengiz (1982) |
| Ceylanpinar | 303.7± 1.0 | 3553.0±19.1 | 3396±17.2 | - | Cebeci and Özkütük (1987) |
| Dalaman | 310.66±2.99 | - | 3843.66±106.31 | 90.60±3.06 | Kumuk (1989) |
| Türkgeldi | 296.96±2.73 | - | 5022.17±97.36 | 123.18±2.67 | Kumuk (1989) |
| Sarmisakli | 285.32±2.51 | - | 5763.53±90.06 | 118.47±2.44 | Kumuk (1989) |
| Tahirova | 313.21±2.37 | - | 4895±96.31 | 98.92±2.88 | Kumuk (1989) |
| Karacabey | 326 | 3322 | 3165 | - | Yildiz and Sengonca (1990) |
| Gökçeada . | 299±9.7 | 4379.3±270.6 | 4413.5±548.5 | - | Soysal and Özder (1992) |
| Tahirova | 307 | - | 4822 | | Ipek (1993) |
| Sakarya | 349.87 | 6111.16 | 5527.96 | 71.8 | Özcan and Altinel (1995) |
| Kumkale | 313.43 | 5519.46 | 5289.87 | 82.72 | Günes (1996) |
| Altindere | 230 | | | 209 | Kaygisiz (1996) |
| Polatli | 284.7±2.5 | 4859.4±61.8 | 4597.3±64.1 | - | Bilgiç and Yener (1999) |
| Malya | 324.8 | | 3298 | 69.1 | Özbeyaz and Küçük (1999) |
| Tahirova | 311.02±2.42 | 6311.68±74.91 | 6170.85±67.06 | 68.09±1.50 | Özçakir and Bakir (2001) |
| Konuklar | 303 | | 6173 | - | Zulkadir and Boztepe (2001) |
| Gelemen | 322 | 4925 | 4564 | - | Akman *et al.* (2001) |
| Koças | 304 | 4966 | 4784 | - | Duru and Tuncel (2002) |
| Reyhanli | 313.08±41.63 | 6427.90±75.03 | 6208.42±69.39 | 61.22±5.00 | Bakir and Çetin (2003) |
| Gökhöyük | 301.7±3.8 | 6467.0±80.9 | 6273.0±100.4 | 82.0±4.0 | Erdem *et al.* (2007) |
| Polatli | 303.40±3.04 | - | 5606.92±75.49 | 98.15±2.25 | Çilek (2009) |

To determine milk yield level of Holstein cows, a lot of studies were done by Çetegen (1978), Tuncel and Eker (1972), Sekerden and Pekel (1981), Cengiz (1982), Cebeci and Özkütük (1987), Kumuk (1989), Günes (1996), Kaygisiz (1996), Bilgiç and Yener (1999), Özbeyaz and Küçük (1999), Pelister *et al.* (2000), Akman *et al.* (2001), Zülkadir and Boztepe (2001), Duru and Tuncel (2002), Bakir and Çetin (2003), Özçakir and Bakir (2003), Çilek and Tekin (2005, 2007), Türkyilmaz *et al.* (2005), Erdem *et al.* (2007) and Çilek (2009). However, different results in these researches were found. To determine milk yield level of Holstein cows, results found in some researches, which were done in Turkey were demonstrated in Table 1. This study was done to determine various, which were occurred together with years at milk yield traits of Holstein cows reared in Tahirova state farm. Furthermore, results, which were found in this study were compared with results in study. Also, it was aimed to determine management condition of farm viewpoint of milk yield traits.

## MATERIALS AND METHODS

Material of study is a total of 1302 milk yield records of cows which are present in Tahirova state farm or culled from herd between 2000 and 2007 years. The lactation duration, lactation milk yield, 305 days milk yield and dry period were estimated from test milk yields collected once a month using the Holland method (Akman and Eliçin, 1984; Çilek and Tekin, 2006a; Çilek, 2009). In this study, 6 calving groups were formed beginning from 2 years and ending at 7 years. Four groups were formed for calving season as winter, spring, summer and autumn. Six groups were formed for parity (lactation number). Eight groups for calving year were formed between 2000 and 2007. Lactations <180 days were not used for the calculation in this study.

To determine effects of age of cow, calving years, lactation number (parity) and calving season on milk yield traits, variance analyze was done by using SAS program (SAS, 1998). Duncan's (1955) multiple range tests was used for multiple comparisons in important subgroups. The model used to analyze effective factors on milk yield was:

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

Where:

$\mu$ = Mean milk yield of cow population
$a_i$ = Parity (lactation number)
$b_j$ = Calving years
$c_k$ = Calving season
$d_l$ = Effect of calving age
$e_{ijklm}$ = Error

## RESULTS AND DISCUSSION

The least square means of lactation duration, lactation milk yield, 305 days milk yield, dry period were 331.74±1.55 days, 7574.39±55.22 kg, 6810.14±56.38 kg and 79.47±0.90, respectively as shown in Table 2. According to variance analyze for milk yield traits, effects of parity and calving years on all milk yield traits (lactation duration, lactation milk yield, 305 days milk yield, dry period) were found statistically significant ($p<0.05$, $p<0.01$).

Table 2: Standard error and least square means values for milk yield traits

| Factors | Lactation duration (days) N | Lactation duration (days) $\bar{x}\pm S_{\bar{x}}$ | Lactation milk yield (kg) ($\bar{x}\pm S_{\bar{x}}$) | 305 days milk yield (kg) ($\bar{x}\pm S_{\bar{x}}$) | Dry period (days) N | Dry period (days) $\bar{x}\pm S_{\bar{x}}$ |
|---|---|---|---|---|---|---|
| **Parity** | - | ** | ** | * | - | ** |
| 1 | 475 | 347.54±7.775a | 8007.75±275.15a | 7115.56±280.96a | 413 | 68.16±4.85c |
| 2 | 327 | 342.93±5.76ab | 7953.88±204.35a | 7192.35±208.67a | 274 | 78.32±3.68bc |
| 3 | 221 | 326.36±5.69b | 7374.75±201.93a | 6727.19±206.20a | 177 | 81.52±3.47bc |
| 4 | 137 | 311.80±7.00b | 6880.11±248.23a | 6162.75±253.47a | 111 | 96.77±4.30a |
| 5 | 81 | 306.31±10.17b | 5728.59±360.78b | 5373.34±368.40b | 55 | 86.30±7.07bc |
| 6 | 61 | 311.39±12.21b | 5792.32±433.10b | 5819.85±442.24b | 47 | 95.16±8.73ab |
| **Calving year** | - | ** | ** | ** | - | ** |
| 2000 | 62 | 314.84±8.27d | 5763.70±293.28d | 5424.94±299.47d | 51 | 89.12±4.75ab |
| 2001 | 75 | 351.36±7.32a | 6939.31±259.91b | 6373.93±265.39bc | 70 | 89.25±4.10ab |
| 2002 | 144 | 332.12±5.38b | 6292.78±191.05d | 5802.54±195.09cd | 142 | 90.55±3.02ab |
| 2003 | 174 | 310.38±5.22d | 6938.39±185.40b | 6601.41±189.31ab | 163 | 89.39±3.00a |
| 2004 | 165 | 311.09±5.23d | 7289.70±185.79ab | 6897.78±189.72a | 146 | 86.07±3.10ab |
| 2005 | 268 | 326.14±4.47bc | 7361.76±158.66ab | 6268.08±162.01c | 220 | 79.89±2.65abc |
| 2006 | 255 | 328.95±4.20bc | 7845.39±149.23a | 7235.05±152.39a | 215 | 78.20±2.55bc |
| 2007 | 159 | 320.22±5.24bcd | 7218.81±186.05b | 6584.33±189.98bc | 68 | 72.49±4.26c |
| **Calving age** | - | ** | * | NS | - | NS |
| 2 | 420 | 317.66±9.13a | 6365.93±323.84a | 5953.77±330.68a | 368 | 89.96±5.87c |
| 3 | 262 | 309.62±7.26bc | 6407.95±257.46a | 6049.93±262.90a | 225 | 84.47±4.78bc |
| 4 | 221 | 321.84±6.76bc | 6708.87±239.85a | 6188.85±244.91a | 177 | 85.08±4.41bc |
| 5 | 163 | 322.13±6.59c | 7046.23±233.97a | 6559.53±238.91a | 126 | 83.51±4.20ab |
| 6 | 109 | 340.52±7.45b | 7564.27±264.52a | 7042.80±270.10a | 91 | 82.53±4.56a |
| 7 | 127 | 334.54±8.92c | 7644.13±316.50b | 6596.16±323.19b | 90 | 80.68±6.55ab |
| **Calving season** | - | * | NS | NS | - | NS |
| Winter | 426 | 315.58±3.93b | 6979.00±139.58a | 6568.25±142.53a | 346 | 81.27±2.38a |
| Spring | 372 | 340.70±4.53a | 7162.70±160.75a | 6332.66±164.15a | 302 | 87.93±2.71a |
| Summer | 255 | 321.15±4.57b | 6768.06±162.07a | 6270.60±165.49a | 209 | 84.19±2.86a |
| Autumn | 249 | 320.11±4.28b | 6915.17±151.97a | 6422.51±155.18a | 220 | 84.10±2.71a |
| Year×season | - | ** | * | NS | - | * |
| Overall mean | - | 331.74±1.55 | 7574.39±55.22 | 6810.14±56.38 | - | 79.47±0.90 |

NS: Non-Significant, *p<0.05, **p<0.01, $\bar{x}$ : means, $S_{\bar{x}}$: Standard error, a-d: Differences between groups with same letter in subgroups of a factor is non-significant, differences between groups with different letter are significant (p<0.01-0.05)

Effects of calving age on lactation duration and lactation milk yield were statistically significant (p<0.05, p<0.01). Although, effect of calving season on lactation duration was significant (p<0.05), effect of calving season on other milk yield traits was non-significant (p>0.05).

According to the results of variance analyze for milk yield traits, effects of all factors (lactation number (parity), year, age, season) on lactation duration were significant (p<0.01, p<0.05). The means of lactation duration was found as 331.74±1.55 days. In dairy cattle breeding, it is wanted a cow is milked ten months and dried 2 month. Lactation duration was found as higher than wanted value (305 days). It can be said that farm management was not willing to dry cows. While, value estimated for lactation duration in this study was similar to results of previous researches in other farms (Güven, 1977; Yildiz and Sengonca, 1990; Yener *et al*., 1994), it was the higher than results of a lot of studies (Çetegen, 1978; Tuncel and Eker, 1972; Sekerden and Pekel, 1981; Cengiz, 1982; Cebeci and Özkütük, 1987; Kumuk, 1989; Günes, 1996; Kaygisiz, 1996; Bilgiç and Yener, 1999; Özbeyaz and Küçük, 1999; Akman *et al*., 2001; Zülkadir and Boztepe, 2001; Duru and Tuncel, 2002; Bakir and Çetin, 2003; Özçakir and Bakir, 2003, Çilek and Tekin, 2005, 2007; Erdem *et al*., 2007; Çilek, 2009) and is the lower than results of some studies (Atay *et al*., 1995; Özcan and Altinel, 1995; Türkyilmaz *et al*., 2005).

Although, the highest lactation duration was found as 347.54 at first lactation, the lower lactation duration was found as 306.31 days at 5th lactation. It can be said that lactation duration decreased with lactation number's increasing. Lactation duration was the highest in 6 years old cows and the lower in 3 years old cows. According this, it can be said that lactation duration increased with increasing of age of cow. As milk yields of cows, increase with age, cows might have been dried at late time of lactation by manager of farm. As milk yield of younger cows was low, younger cows were dried at early time of lactation by manager of farm. Thus, lactation duration of aged cows may be longer than lactation duration of young cows.

Although, effects of parity, calving year and calving age on lactation milk yield were significant (p<0.01, p<0.05), effect of season was non-significant (p>0.05). Means of lactation milk yield was found 7574.39±55.22 kg. This milk yield value quite higher than other state farm in Turkey's condition. This value was close to values informed as 7164 kg by Yener *et al*. (1994), but is lower

than all studies in other farms (Akman *et al*., 2001; Zülkadir and Boztepe, 2001; Duru and Tuncel, 2002; Bakir and Çetin, 2003; Özçakir and Bakir, 2003; Erdem *et al*., 2007; Çilek, 2009).

According to variance analyze for 305 days milk yield, effects of lactation number (parity) and calving year on 305 days milk yield were statistically significant ($p<0.01$-$0.05$).

Means of lactation 305 days milk yield was found 6810.14±56.38 kg. This milk yield value was quite higher than (Güven, 1977; Cengiz, 1982; Cebeci and Özkütük, 1987; Kumuk, 1989; Yildiz and Sengonca, 1990; Soysal and Özder, 1992; Ipek, 1993; Atay *et al*., 1995; Özcan and Altinel, 1995, 1995; Günes, 1996; Kaygisiz, 1996; Bilgiç and Yener, 1999; Özbeyaz and Küçük, 1999; Akman *et al*., 2001; Zülkadir and Boztepe, 2001; Duru and Tuncel, 2002; Bakir and Çetin, 2003; Erdem *et al*., 2007) in other state farms in Turkey's condition. This value is very close to value informed as 6776.9 kg by Yener *et al*. (1994).

While, the lowest lactation milk yield and 305 days milk yield was seen in 2000 years, the highest milk yield was seen in 2006. According to this, it can be thought that increasing of milk yield with advanced years may have been performed with improvement of environmental conditions and true selection of daughter. It was reported milk yields of cows increase until 6 years old, which accepted as mature age (Çilek, 2002, 2009; Çilek and Tekin, 2005, 2006b). Similarly, it can be said milk yield increased with age up to maturity and decreased later in this study. Although, effects of calving season on 305 days milk yield and lactation milk yield were non-significant, it was reported that calving season affected on 305 days milk yield, also the highest 305 days milk yield was in cows in calved at winter, the lowest milk yield was in cows in calved at summer (Alpan and Arpacik, 1998; Çilek, 2009).

Milk yield of cows calved at winter was higher than cows calved at summer because of improvement of feeding level (Alpan and Arpacik, 1998; Çilek, 2009). Çilek and Tekin (2005) reported that cow calving in winter have high milk yield, due to good feeding levels in the first 3 or 4 months of lactation and increase milk yield due to feed with green grass and during the period when milk yield begins to decrease. Tahirhova state farm in Balikesir province in Aegean region of Turkey have mild climate. Temperature differences in among seasons are small in Tahirhova state farm. Furthermore, differences of feeding among seasons are small because of available of green grass in every season. This climatic trait may be reason that effect of season on milk yield was non significant.

Though effects of lactation number and calving year on dry period were statistically significant ($p<0.01$), effects of calving season and calving age were non-significant ($p>0.05$). Means of dry period was 79.47±0.90 days. Dry period was higher than wanted value (60 days) for dairy cattle breeding. It should be paid attention when cows were dry in state farm. The dry period was found lowest as 68.16±4.85 days for cows in first lactation and highest as 96.77±4.30 days for cows in 4th lactation.

The dry period was found highest as 89.96±5.87 days for in 2 years old cows and lowest as 80.68±6.55 days for in 7 years old cows. It can be said that dry period decreased with increasing of calving age. As older cows with high yield in herd keep at lactation in long time, lactation duration is longer and thus, dry period is shorter. While value of dry period is lower than values found between 114 days and 209 days in previous researches in other state farm (Cengiz, 1982; Kumuk, 1989; Kaygisiz, 1996), this value is similar to values found between 81 and 82 by Çilek and Tekin (2005) and Erdem *et al*. (2007).

## CONCLUSION

When results about milk production characteristics of Holstein cows raised in Tahirova state farm were compared with other state farms in Turkey. It can be said that milk yield of Holstein cows reared at Tahirova state farm (Aegean region of Turkey) is very good and important for Turkey. Milk yield of Holstein cows at Polatli state farm in Middle Anatolia with steppe climate conditions was reported 5606.92 kg in previous study (Çilek, 2009). As it was expected, milk yield of Holstein cows in Tahirhova state farm with mild climate was higher than Polatli state farm with steppe climate. Higher milk yield in Tahirhova state farm with mild climate can be obtained with improvement of feeding and genetic structure of cows. In this state farm, milk yield value was higher than value of previous study by Özçakir and Bakir (2003). Increasing of milk yield level in Tahirova state farm can be result of improvement of methods of feeding and attention and doing true selection according to milk yield. However, milk level of Holstein cows reared at Tahirova state farm is lower than yields of cows reared at countries of European Union. Milk yield level should be increased in this state farm. To increase milk yield level, feeding and care of cows should be done appropriately and selection of heifers and culling of cows according to milk yield should be done with more true selection methods.

## REFERENCES


Alpan, O. and R. Arpacik, 1998. Breeding of cattle. Sahin Matbaasi, Ankara.

Akman, N. and E. Eliçin, 1984. Süt Sigirlarinda Kayit Tutma ve Degerlendirme, Hayvancilikta Ileri Teknikler Seminer Tebligi, Tahirova-Gönen. Ankara Üniv Zir Fak Ofset Ünitesi, Ankara.

Akman, N., Z. Ulutas, H. Efil and S. Biçer, 2001. Milk and fertility characteristics in Black pied herd reared Gelemen state farm. J. Fac. Agric., Atatürk Uni., 32 (2): 173-179.

Akman, N., E. Tuncel, M. Yener, K. Özkütük, N. Tüzemen, M. Yanar, A. Koç, O. Sahin and Ç.Y. Kaya, 2005. Türkiye'de Sigir Yetistiriciligi. Türkiye Ziraat Mühendisligi VI Teknik Kongresi, 3-7 Ocak, Ankara, pp: 687-706.

Anonymous, 2006. Hayvancilik Istatistikleri. Türkiye Istatistik Kurumu, Ankara. Erisim.

Atay, O., S.M. Yener, G. Bakir and A. Kaygisiz, 1995. Ankara Atatürk Orman çiftliginde yetistirilen Siyah Alaca sigirlarin süt verim özelliklerine iliskin genetik ve fenotipik parametre tahminleri. Turk. J. Vet. Anim. Sci., 19: 441-447.

Bakir, G. and M. Çetin, 2003. Reyhanli Tarim Isletmesinde yetistirilen Siyah Alaca sigirlarda döl ve süt verim özellikleri. Turk. J. Vet. Anim. Sci., 27: 173-180.

Bilgiç, N. and S.M. Yener, 1999. Ankara Üniversitesi Ziraat Fakültesi Zootekni Bölümü Sigircilik Isletmesinde Yetistirilen Siyah Alaca ineklerde bazi süt ve döl verimi özellikleri. Tar. Bil. Derg., 5 (2): 81-84.

Cebeci, Z. and K. Özkütük, 1987. Ceylanpinar Tarim Isletmesi Siyah Alaca sigir populasyonu üzerinde bir çalisma. Çukurova Üniv., Fen ve Müh Bilimleri Derg, 1 (3): 55-67.

Cengiz, F., 1982. Malya ve Kocas Devlet Üretme Çiftlikleri kosullarin da Siyah Alaca ve Esmer sigirlarin çesitli özellikler bakimindan karsilastirilmasi. Süt ve döl verim özellikleri. Doktora tezi. Ankara Üniv., Fen Bil Enst, Ankara.

Çetegen, D., 1978. Sakarya Inekhanesi holstaynlarinin 1971-1975 yillarinda süt verimleri üzerinde bir çalisma. J. Lalahan Livest. Central Res. Inst., 18 (3-4): 78-99.

Çilek, S., 2002. Estimation of factors for standardizing lactations to mature age and 305 days and heritabilty and repeatability of milk yield for Brown Swiss cattle reared at Ulas State Farm. Ph.D. Thesis. Selçuk University the Institute for Health Sciences, Konya, Turkey, pp: 5-57.

Çilek, S. and M.E. Tekin, 2005. The environmental factors effecting milk yield and fertility traits of Simmental cattle raised at Kazova State Farm and phenotypic correlations between these traits. Turk. J. Vet. Anim. Sci., 29: 987-993.

Çilek, S. and M.E. Tekin, 2006a. Calculation of adjustment factors for Standardizing Lactations to Mature Age and 305 days and Estimation of Heritability and Repeatability of Standardized Milk Yield of Simmental Cattle Reared on Kazova State Farm. Turk. J. Vet. Anim. Sci., 30: 283-289.

Çilek, S. and M.E. Tekin, 2006b. Estimation of factors for standardizing lactation yield to mature equivalent and 305 day basis for brown Swiss cattle reared at Ulas State Farm. Indian J. Anim. Sci., 76 (8): 621-624.

Çilek, S. and M.E. Tekin, 2007. Environmental Factors Affecting Milk Yield Traits of Brown Swiss Cows Raised at Ulas State Farm and Phenotypic Correlations between milk yield and fertility traits. Indian J. Anim. Sci., 77 (2): 154-157.

Çilek, S., 2008. Estimation of adjustment factors for standardizing lactations to mature age and 305 days of milk yield of Holstein cattle reared at Polatli State farm in Turkey. J. Anim. Vet. Adv., 7 (9): 1056-1060.

Çilek, S., 2009. Milk yield traits of Holstein cows raised at Polatli State farm in Turkey. J. Anim. Vet. Adv., 8 (1): 6-10.

Duncan, W.R., 1955. Multiple range and multiple F-tests. Biometrics, 11: 1-42.

Duru, S. and E. Tuncel, 2002. Koças Tarim Isletmesinde yetistirilen Siyah Alaca sigirlarin süt ve döl verimleri üzerine bir Arastirma. 1. Süt verim özellikleri. Turk. J. Vet. Anim. Sci., 26: 97-101.

Erdem, H., S. Atasever and E. Kul, 2007. Milk yield and fertility traits of Holstein cows raised at Gokhoyük State Farm, 1. Milk Yield Traits. J. Fac. Agric., Ondokuz Mayis University, 22 (1): 41-46.

Günes, H., 1996. Kumkale Tarim Isletmesinde on yillik Siyah Alaca sigir yetistiriciligi üzerinde arastirmalar. Süt verim özellikleri. Istanbul Üniv., Vet. Fak. Derg, 22 (2): 225-240.

Güven, Y., 1977. Ankara Seker Fabrikasi Çiftliginde Yetistirilen Siyah Alaca ve Esmer irk sigirlarda süt ve döl verimleri üzerinde karsilastirmali arastirmalar. Doktora tezi. Ankara Üniv Fen Bil Enst, Ankara.

Ipek, A., 1993. Tahirova Tarim Isletmesinde yetistirilen sigirlarin süt ve döl verimleri üzerine bir arastirma. Yüksek Lisans Tezi. Uludag Üniv Fen Bil Enst, Bursa.

Kaygisiz, A., 1996. Kahramanmaras Tarim Isletmesi Siyah Alaca Sürüsünde Süt Verimine Iliskin Yönelim Unsurlarinin Tahmini. Tar Bil Derg, 2 (3): 71-73.

Kumuk, T., 1989. Türkiye'nin bati kesiminde yer alan ve Siyah Alaca sigir yetistiriciligi yapilan bazi devlet tarim isletmelerinin teknik analizi. Doktora Tezi. Ege Üniv., Fen Bil Enst, Izmir.

Kutlu, H.R., A. Gül and M. Görgülü, 2003. Türkiye Hayvanciliginin Sorunlari ve Çözüm Yollari 1. Damizlik Hayvan-Kaliteli Yem. Yem Magazin Dergisi, Sayi, 34: 40-46.

Özbeyaz, C. and M. Küçük, 1999. Malya Tarim isletmesi Esmer irki ineklerde süt verim özellikleri. Lalahan Hay Arast Enst. Derg, 39 (2): 7-16.

Özcan, M. and A. Altinel, 1995. Siyah Alaca sigirlarin yasama gücü, döl verimi ve süt verimi özelliklerini etkileyen bazi çevresel faktörler üzerinde arastirmalar. 2. Süt verim özellikleri. Istanbul Üniv., Vet. Fak. Derg., 21 (1): 36-48.

Özçakir, A. and G. Bakir, 2003. Tahirova Tarim isletmesinde yetistirilen Siyah Alaca Sigirlarda döl ve süt verim özellikleri. 1. Süt verim özellikleri. Atatürk Üniv. Ziraat Fak. Derg., 34 (2): 145-149.

Pelister, B., A. Altinel and H. Günes, 2000. Özel isletme kosullarinda yetistirilen degisik orijinli Siyah Alaca sigirlarin süt verimi özellikleri üzerinde arastirmalar. Istanbul Üniv. Vet. Fak. Derg, 26 (1): 201-214.

SAS, 1998. Sas Users Guide: Statistics, Inc.

Soysal, M.I. and M. Özder, 1992. Gökçeada Tarim isletmesinde yetistirilen Siyah Alacalarin bazi süt ve döl verim özellikleri üzerine arastirmalar. Tekirdag Zir. Fak. Derg, 1 (1): 147-157.

Sekerden, Ö. and E. Pekel, 1981. Polatli Devlet Üretme Çiftliginde yetistirilen Saf Siyah Alaca, Kilis tipi Güney Kirmizisi sigirlar ve bunlarin melezlerinin döl ve süt verim özellikleri ile bazi parametrelerin tahmini üzerine bir arastirma. Çukurova Üniv., Zir. Fak. Yilligi, 13 (3-4): 14-27.

Tuncel, E. and M. Eker, 1972. Yalova Devlet Üretme Çiftliginde yetistirilen Siyah Alaca sigirlarda döl ve süt verimiyle ilgili özellikler üzerinde arastirmalar. Ankara Üniv. Zir. Fak. Yilligi, 21 (3-4): 410-430.

Türkyilmaz, M.K., H.E. Bardakçioglu and A. Nazligül, 2005. Effect of some factors on milk yield in Holstein cows. J. Fac. Vet. Med., Univ. Kafkas, 11 (1): 69-72.

Yener, S.M., G. Bakir and A. Kaygisiz, 1994. Ankara Seker Fabrikasi Çiftliginde yetistirilen Siyah Alaca sigirlarin süt verim özellikleri. Turk. J. Vet. Anim. Sci., 12: 385-389.

Yildiz, H.D. and M. Sengonca, 1990. Karacabey Tarim Isletmesinde Yetistirilen Amerikan Kökenli Siyah Alaca Sigirlarin Verim Özellikleri Üzerinde Arastirmalar. Uludag Üniv, Fen Bil Enst, Bilimsel Raporlar Serisi, Bursa, 7: 12s.

Zülkadir, U. and S. Boztepe, 2001. Konuklar Tarim Isletmesinde yetistirilen Esmer sigirlarin bazi verim özelliklerinin fenotipik ve genetik parametreleri I. Fenotipik parametreler. Selçuk Üniv. Zir. Fak. Derg, 15 (27): 1-10.