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THE EFFECT OF PHENOTYPIC AND GENOTYPIC FACTORS ON SOME YIELD TRAITS IN HOLSTEIN FRIESIAN COWS WITH HIGH MILK YIELD REARED IN TÜRKİYE

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Abstract: This study was carried out to determine the effects and phenotypic relationships of some environmental factors (first calving age, calving year, and calving season) on Lactation period, dry period, milk yield and Milkability traits. The material of the study was the lactation records of 1079 Holstein cows raised in a private dairy farm. As a result of analyses, the values of 305-DMY yield (305 DMY), the lactation period (LP), dry period (DP), time to reach peak yield (Tmax), peak yield (Ymax), average daily milk yield (ADMY), total lactation milk yield (ATMY) and age at first calving (AFC) were determined as 9926.3±178.1 kg, 318.1±1.4 days, 60.05±0.9 days, 95.2±2.1 days, 42.3±0.3 kg, 32.2±0.3 kg, 10248.7±94.1, and 26.7±0.2 months, respectively. The study found the average milk flow rate (MFR) and the average milking time (MT) as 2.0±0.0 kg min^{-1} and 360.9±4.7 seconds, respectively. In addition, estimates of the 305-day mature equivalent milk yield (ME 305-d) and MFR were also found to be 0.41±0.24 and 0.51±0.30, respectively. As a result, this dairy farm can be recommended as an example to breeders who have just started their dairy farm in Türkiye and countries with similar environmental conditions and are looking for a model.

Keywords: Calving, Heritability, Holstein Friesian, Milkability, Milk yield

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1. Introduction

The Holstein Friesian cattle breed has been taken to many countries of the world as a breeding breed due to its high yield and adaptation characteristics (Kaygısız et al., 2017). Breeders prefer Holstein Friesian cattle due to their high milk yield, good fattening performance, and their easy adaptation to the environment where they are taken to (Koçak et al., 2007; URL, 2016). The Holstein Friesian breed is a breed developed under good care, feeding and cool climatic conditions. Therefore, they best demonstrate their yield ability in cool-climate plain areas where abundant forage can be produced. In areas with hot climates, the level of yield falls under poor care and feeding conditions (URL, 2016).

Dairy cattle breeding, it is mainly aimed to increase milk yield. To achieve the desired success in the breeding study to be applied, it is necessary to determine the relationship between milk yield characteristics. Milk yield characteristics are properties that affect each other in selection. The relationships between these characteristics need to be calculated accurately and reliably. This will directly affect selection success in herd management (Genç and Soysal, 2018). The main economic goal of dairy cattle prodution is to obtain high levels of quality milk (Koçak et al., 2007; Erdem and Okuyucu, 2020). Obtaining a high milk level from a cow depends on the continuity of fertility. In an ideal herd, it is aimed to take one calf per year from each cow. For this, it is necessary to keep some parameters (the dry period is 60 days, the first insemination age is 450-500 days, the service period is 80 days, and the calving interval is 365 days) within certain limits. The age at which female cattle raised as a breeder gives their first calf is known as the first calving age (FCA). For a profitable breeding, this period is expected to be between 24-26 months in culture breeds (Beavers and Doormaal, 2015). Many studies have shown that optimal FCA is ≤ 24 months (Shamay et al., 2005; Stevenson et al., 2008).

The optimal age at first calving in Holstein cows is considered to be 24 months. Today, many cows appear to have their first calves at the age of 22-23 months (Ettema and Santos, 2004; Mohd Nor et al., 2013; Heinrichs et al., 2017). However, Hutchison et al. (2017) reported that cows calving at the age of 24 months gave higher milk in the first lactation and had shorter long-term milk yields than those calving at the age of 21 and 22 months. There is no negative effect on milk yield and body health of Holstein cows at 22-24 months of age (Nilforooshan and

Edriss, 2004).

The effect of the calving season on milk production is due to factors such as heat stress and photoperiod in addition to the diversity of food sources. Studies have shown that milk production increases in cows calving in autumn, whereas it decreases in cows calving in spring (Barash et al., 1996; Coulon and Pe´rochon, 2000; Dahl and Petitclerc, 2003).

In some studies, it has been observed that calving year has a significant effect on all milk yield characteristics such as 305 DMY, dry period, lactation period (Çilek and Tekin, 2005; M'hamdi et al., 2012). It has been reported that the differences observed in nutrition, care-management factors between calving years have a significant effect on milk yield (Çobanoğlu and Kul, 2019).

Dairy cows need a certain dry period between two lactations to give a regular and sufficient amount of milk in the second and later lactations. This period is associated with dairy cows' milk yield, milk composition, reproductive performance, calves' birth weight, survival rate, and growth performance. Most dairy farms have a dry period of 51-60 days. (Grummer and Rastani, 2004; Collier et al., 2012; Hossein-Zadeh and Mohit, 2013; Rahbar et al., 2016; Kıyıcı et al., 2020).

One of the characteristics of economic importance in dairy cattle is milk ability, which is defined as the ease of milking of dairy cows (Meyer and Burnside, 1987; Gray et al., 2011). The most common of the Milkability characteristics are MFR, MT, and maximum MFR (Güler et al., 2009). The Milkability characteristic is also used in the selection criterion of animals (Bruckmaier et al., 1995), in the monitoring of animal breeding and breast health (Duda, 1995; Naumann et al., 1998), and in the development of milking machines and the regulation of parameters for their use (Rasmussen, 1993).

In a study conducted in the Eastern Cape and Gauteng Provinces of South Africa, the means for milking time (MT), mean milk flow (AMF), maximum milk flow (MMF) and somatic cell score (SCS) were 5.20 min, 1.91 kgmin^{-1}, 2.99 kg min^{-1}and 2, respectively (Tshilate et al., 2020).

Managing and evaluating of milkability helps the effective use of the labor force. Also, it is a functional characteristic that should be considered in addition to characteristics such as calving ease, fertility, feed conversion, and health (Gäde et al., 2006), and its main indicators are MFR, MT, and the highest milk flow rate (HMFR) (Güler et al., 2009).

For imported breeds, the most important adaptation criteria are calf and/or cow life force. For this reason, in dairy cattle enterprises, live calves should be obtained once a year and work should be carried out to reduce calf losses as much as possible (Karakaş, 2002). It has been determined that breeders in different regions also adopt the Holstein Friesian breed brought to Türkiye, but there are significant problems in terms of care, feeding and housing (Kaygısız et al., 2017). Therefore, the need arises to investigate adaptation abilities in culture breed cattle populations imported from different countries. To date, most of the adaptation studies related to cattle of the culture breed have been conducted in public enterprises. No extensive research has been conducted on the yield level of the breed under breeder conditions. Unlike previous studies, this study was conducted in breeder conditions.

The purpose of this study was to determine the current milk yield and Milkability characteristics (milk flow rate, the milking time) of the Holstein Friesian breed grown in a private enterprise in Balikesir province, to determine the effects of phenotypic, genetic and environmental factors on these characteristics, and to contribute to breeding and selection studies in the light of scientific studies.

2. Materials and Methods

The research material was the lactation records between 2013 and 2016 of 1079 Holstein cows raised in a private dairy farm. These yield records and pedigree records are kept in the herdbook system by the Turkish Cattle Breeders Association.

In the study, average daily milk yield (ADMY), total lactation milk yield (TMY), Adjusted milk yield for 305 days (305-DMY), mature age equivalent of cow expresses milk yield adjusted for 305 days (ME-305-d milk yield :ME 305-d) lactation period (LP), dry period (DP), first calving age (CA), Milkability traits are milking time (MT) measured in minutes, average milk flow rate (AMF) measured in kilogram per minutes were examined.

Milkability is the rate at which milk is completely drawn from a cow's udder, which measures the cow's ability to let down milk and to be completely milked. Generally, the Milkability of a cow is expressed as a function of milking speed and milking time, measured by either manual scoring or using specially designed instruments. The most used Milkability traits are milking time (MT), measured in minutes, and average milk flow rate (AMF) measured in kilogram per minute and also measured in kilograms per minutes. These provide valuable information about the efficiency and capability of milk release (Tshilate et al., 2020).

To determine effects of calving age (CA), calving season, and calving year on milk yield, and Milkability characteristics, the Variance Analysis Method was used with the help of the SAS program (Orhan et al., 2004). Duncan test was used to compare subgroups. The mathematical equation used to determine the effect of environmental factors is given below (Equation 1).

$$Yijkl=\mu+ai+cj+dk+eijkl \quad (1)$$

where;

Y_{ijklm} refers to observation value related to the examined characteristic of l cow at i calving year, j calving season, and k calving age.

μ: Population mean,

a_i: The impact amount of i calving year (2013, 2014, 2015, 2016),

c_j: The impact amount of j calving season (winter, spring, summer, autumn),

d_k: Impact amount of k calving age (20-24, 25-30, 31-36, 37-45), and

e_{ijkl}: Term of the random error.

Variance elements and heritability levels belonging to milk yield and milk flow rate were estimated with a computer program by using the Restricted Maximum Likelihood (REML) technique (Multiple Trait Derivate Free Restricted Maximum Likelihood MTDFREML) (Boldman et al., 1993).

3. Results

The effect of calving year, calving season and calving age on lactation duration was insignificant (P>0.05). Whereas the effect of calving year on 305-DMY yield was not statistically significant (P>0.05), effects of calving season and calving age were found to be significant (P<0.01 and P<0.05, respectively). While the effect of calving year on dry period was determined as significant (P<0.05), effects of calving season and calving age were not significant (Table 1).

The least squares mean and significance levels of factors affecting ADMY, TMY and AMY are given in Table (2).

Table 1. Least squares mean, standard errors, significance, and multiple comparison test results of LP, 305-DMY and DP by calving year, calving season, calving age and Duncan test

Factors	N	LP (day) $\overline{X}\pm s_{\bar{x}}$	N	305-DMY (kg) $\overline{X}\pm s_{\bar{x}}$	N	DP (day) $\overline{X}\pm s_{\bar{x}}$
Calving Year		ns		ns		*
2013	82	319.89±3.12	82	10106.71±178.11^{b}	82	63.24±1.21^{b}
2014	87	319.31±3.03	87	9956.14±167.84^{ab}	73	58.00±1.48^{ab}
2015	128	317.07±2.08	128	9914.79±126.16 ^{ab}	9	55.67±2.75^{a}
2016	36	315.03±4.21	36	9487.28±212.08^{a}	-	-
Calving Season		ns		**		ns
Winter	94	320.14±2.77^{ab}	94	10081.65±160.84^{b}	47	61.15±2.05
Spring	57	311.79±3.10^{a}	57	9506.14±185.72^{a}	21	64.57±4.06
Summer	75	321.15±3.31^{b}	75	9546.00±181.08^{a}	43	58.86±1.20
Autumn	107	317.63±2.43^{ab}	107	10281.25±130.01^{b}	53	59.62±1.19
First Calving Age (Mo)		ns		*		ns
20-24	108	318.65±2.59	108	9571.34±137.44	34	62.15±1.86
25-30	177	318.52±1.97	177	10121.25±107.12	97	58.77±0.91
31-36	34	314.91±3.91	34	10179.09±265.03	23	64.96±4.36
37-45	14	317.00±7.54	14	9593.79±611.07	10	61.30±3.20

ns= non-significant (P>0.05), *= significant at the level of P<0.05, **= significant at the level of P<0.01, LP= lactation period (day), 305-DMY= 305-days milk yield (kg), DP= dry period (day), Mo= months, ab= the difference between averages (mean) indicated by different letters in the same column is significant.

Table 2. Least squares mean and standard errors of ADMY, TMY and AMY by calving year, calving season, calving age and Duncan test

Factors	N	ADMY (kg) $\overline{X}\pm s_{\bar{x}}$	N	TMY (kg) $\overline{X}\pm s_{\bar{x}}$	N	AMY (kg) $\overline{X}\pm s_{\bar{x}}$
Calving Year		ns		ns		ns
2013	82	32.75±0.57^{b}	82	10464.86±201.45^{b}	82	10761.06±181.85^{b}
2014	87	32.32±0.54^{ab}	87	10330.79±203.58^{b}	87	11021.48±178.99^{ab}
2015	128	32.22±0.42 ^{ab}	128	10204.85±138.56^{ab}	128	11387.60±148.74^{b}
2016	36	30.88±0.68^{a}	36	9713.29±238.52^{a}	36	11490.50±286.58^{a}
Calving Season		**		*		ns
Winter	94	32.60±0.53^{b}	94	10417.01±177.30^{bc}	94	11460.54±148.80^{ab}
Spring	57	31.10±0.60^{a}	57	9696.14±208.37^{a}	57	11083.52±125.17^{b}
Summer	75	31.01±0.59^{a}	75	9960.67±212.07^{ab}	75	11037.97±311.24^{b}
Autumn	107	33.37±0.41^{b}	107	10596.89±156.04^{c}	107	9838.21±571.30^{a}
First Calving Age (Mo)		*		*		**
20-24	108	31.10±0.45	108	9889.45±154.09	108	11460.54±148.80^{ab}
25-30	177	32.86±0.34	177	10463.08±126.08	177	11083.52±125.17^{b}
31-36	34	33.11±0.85	34	10420.57±289.85	34	11037.97±311.24^{b}
37-45	14	30.99±1.93	14	9890.80±702.25	14	9838.21±571.30^{a}

ns= non-significant (P>0.05), *= significant at the level of P<0.05, **= significant at the level of P<0.01, ADMY= average daily milk yield (kg), TMY= total lactation milk yield (kg), AMY= ME-305-d milk yield (kg), Mo= months, ab= the difference between averages (mean) indicated by different letters in the same column is significant.

Least squares mean and significance levels of the average daily milk yield, Total lactation milk yield (TMY) and ME-305-d milk yield (ME 305-d) are given in Table 2. According to this, whereas the average daily milk yield was not affected by calving year, it was affected significantly by calving season (P<0.01) and calving age (P<0.05) (Table 2).

The least squares mean for the time to reach peak day, peak day milk yield, milk flow rate, and milking time by calving year, calving season, and calving age are given in Table 3.

Whereas the average peak-day milk yield and milk flow rate were not affected by calving year, time to reach peak day and milking time were affected significantly by calving year (P<0.05). While milk flow rate and milking time were not affected by calving season, time to reach peak day, and peak-day milk yield were affected. Whereas time to reach peak day, milk flow rate, and milking time were not affected by first calving age, peak-day milk yield was affected (P<0.05) (Table 3).

In this context, phenotypic correlations between milk yield and Milkability of Holstein Friesian cattle were examined in this study, and summarized in Table 4.

Table 3. Least squares mean, standard errors and significance levels of the time to reach peak day, peak-day milk yield, milk flow rate, and milking time by calving year, calving season, and calving age

Factors	N	T_{max}(day)	N	Y_{max}(kg)	N	MFR	N	MT
		$\bar{X} \pm S_{\bar{x}}$		$\bar{X} \pm S_{\bar{x}}$		$\bar{X} \pm S_{\bar{x}}$		$\bar{X} \pm S_{\bar{x}}$
Calving Year		*		ns		ns		*
2013	82	102.84±4.82^{b}	82	42.09±0.57	82	2.08±0.06	82	337.02±10.73^{a}
2014	87	100.01±4.16^{b}	87	42.67±0.62	87	1.94±0.05	87	369.94±9.73^{b}
2015	128	90.03±3.01^{ab}	128	42.20±0.53	128	1.95±0.03	128	367.22±6.23^{b}
2016	36	84.33±4.28^{a}	36	41.87±0.88	36	1.96±0.06	36	371.11±15.23^{b}
Calving Season		*		**		ns		ns
Winter	94	99.26±3.50^{b}	94	42.98±0.65^{b}	94	1.94±0.04^{ab}	94	374.82±7.51
Spring	57	80.79±4.64^{a}	57	42.53±0.74^{b}	57	1.99±0.06^{ab}	57	361.53±10.89
Summer	75	97.83±5.56^{b}	75	40.10±0.60^{a}	75	1.90±0.06^{a}	75	347.81±12.64
Autumn	107	97.40±3.07^{b}	107	43.00±0.48^{b}	107	2.06±0.04^{b}	107	357.56±7.68
First Calving Age (Mo)		ns		**		ns		ns
20-24	108	91.79±3.65	108	40.44±0.53^{a}	108	2.01±0.04	108	349.81±7.35
25-30	177	98.37±2.80	177	43.15±0.39^{ab}	177	1.99±0.03	177	363.58±6.52
31-36	34	90.71±7.13	34	43.49±0.93^{b}	34	1.87±0.09	34	373.97±15.97
37-45	14	91.86±7.60	14	42.03±2.46^{ab}	14	1.79±0.18	14	381.14±32.84

ns= non-significant (P>0.05), *= significant at the level of P<0.05, **= significant at the level of P<0.01, T_{max}= time to reach peak day (day), Y_{max}= peak-day milk yield (kg), MFR= milk flow rate, MT= milking time, Mo= months, ab= the difference between averages (means) indicated by different letters in the same column is significant.

Table 4. Phenotypic correlations between milk yield, fertility, and milkability characteristics of the Holstein Friesian cattle

	305-DMY	AMY	CA	ADMY	LP	TMY	T_{max}	T_{max}	MFR	MT	DP
AMY	0.986**	1									
CA	0.122*	0.160**	1								
ADMY	-0.056	-0.057	-0.091	1							
LP	-0.043	-0.058	-0.060	-0.043	1						
TMY	-0.070	-0.080	-0.112*	0.869**	0.451**	1					
T_{max}	-0.042	-0.073	-0.171**	0.126*	0.227**	0.228**	1				
Y_{max}	-0.001	-0.001	-0.012	0.890**	-0.009	0.790**	0.010	1			
MFR	-0.095	-0.095	-0.092	0.313**	0.058	0.306**	-0.075	0.358**	1		
MT	-0.003	0.006	0.126*	0.161**	-0.063	0.113*	0.089	0.137*	-0.383**	1	
DP	-0.083	-0.088	-0.232**	-0.149	0.008	-0.114	0.116	-0.181*	-0.128	-0.036	1
AFC	-0.176**	-0.189**	-0.095	0.046	-0.046	0.026	-0.027	0.123*	-0.107	0.080	0.059

*= significant at the level of P<0.05, **= significant at the level of P<0.01, 305 DMY= 305-days milk yield (kg), AMY= ME-305-d milk yield (kg), CA= first calving age, ADMY= average daily milk yield (kg), LP= lactation period (day), TMY= total lactation milk yield (kg), T_{max}= time to reach peak day (day), Y_{max}= peak-day milk yield (kg), MFR= milk flow rate (kgdk^{-1}), MT= milking time (dk), DP= dry period (day), AFC= age at first calving (day), between the characteristics, r<0.5 indicates to weak, 0.5<r<0.7 indicates to moderate, and 0.7<r indicates to high.

Table 5. Variance elements and heritability estimates of AMY and MFR

Parameters	σ^2_a	σ^2_e	σ^2_p	σ^2_{a1a2}	h^2
ME-305-d milk yield (AMY)	116.264	169.665	285.929	-	0.41±0.24
Milk Flow Rate (MFR)	0.10536	0.10192	0.20728	-	0.51±0.30
Genetic Correlation of AMY x MFR	-	-	-	0.18258	0.52±0.35

MFR= milk flow rate, AMY= ME-305-d milk yield.

Positive and significant correlations were identified between 305DMY and ME 305-D; ME 305-D and CA; CA and Tmax; ADMY and TMY, Ymax, MFR and MT; LP and TMY and Tmax; TMY and Tmax, Ymax, and MFR; Ymax and MFR and MT (P<0.01). On the other hand, there was a negative and significant relationship between 305 DMY and AFC, between ME 305-D and ACF, and between CA and DP (P<0.01) (Table 4). It was determined that there was a positive and significant correlation between CA and MT; ADMY and Tmax; TMY and MT; Ymax and MT and AFC (P<0.05). In addition, there was a negative and significant correlation between CA and TMY and between Ymax and DP (P<0.05) (Table 4).

Estimations related to variance elements and heritability levels for ME-305-d milk yield and milk flow rate values are presented in Table 5.

In this study, heritability estimates calculated by using REML technique for ME-305-d milk yield and milk flow rate were found to be 0.41±0.24 and 0.51±0.30, respectively.

Among milk yield characteristics, heritability levels of ME-305-d milk yield and Milk flow rate were found to be high. For this reason, it seems possible for them to progress through selection. Therefore, to increase yield at the herd level, cows and their calves with the desired characteristics should be kept in breeding.

4. Discussion

The mean lactation period examined in terms of milk yield characteristics was found as 318.1±1.4 days (Table 1). This value was 13 days longer than the standard lactation period. This might be because the enterprise's care, management and feeding conditions had not changed depending on the years and seasons. Compared to other studies, the obtained lactation period was shorter than values determined by Boğokşayan and Bakır (2013) (343 days), Sahin and Ulutas (2012) (326 days), and Genc and Soysal (2018) (364 days), while it was longer than values found by Toghiani (2012) (279 days) and Hossein-Zadeh (2012) (292 days). On the other hand, it showed a similarity with the value (319 days) determined by Sahin and Ulutas (2011). This value was higher than values obtained by some studies conducted on Holstein Friesian cattle herds, such as Toghiani (2012) (6564 kg), Sahin and Ulutas (2012) (6606 kg), Zavadilová and Zink (2013) (5870 kg), Tiezzi et al. (2013) (9760 kg), Boğokşayan ve Bakır (2013) (5673 kg), EHRC (2020) (6785 kg), Genc and Soysal (2018) (6010±3.48 kg) and Karaağaç and Genç (2019) (7350.5±30.70 kg).

In this study, the mean dry period was identified as 60.5±0.9 days and this value was within the limits generally considered ideal in dairy cattle breeding (Table 1). Compared to the findings of other researchers, this value was lower than values found by Genç and Soysal (2018) (61.8±0.1 days) and Sahin and Ulutas (2011) (85 days). It was determined that the values obtained for DP were close to the ideal duration. This can be interpreted as that herd care, supervision, and management were done well.

When Table 2 was examined, the average daily milk yield in Holstein Friesian cattle was determined as 32.23±0.27 kg and this value was higher than values determined by Akkas and Sahin (2008) (17.4 kg), Bayril and Yılmaz (2010) (25.8 kg) and Yildirim et al. (2018) (24.91±0.2 kg). Total lactation milk yield (10248.64±94.08 kg) obtained in this study was higher than values found as 4998.58±1.63 kg and 7160.6±33.0 kg by Duru and Tuncel (2004) and Özkök and Uğur (2007), respectively. ME-305-d milk yield (11148.79±92.59 kg), on the other hand, was found to be higher than the value (7882.4 kg) obtained in the study conducted by Bayril and Yilmaz (2010).

This study determined the mean time to reach peak and peak-day milk yields as 95.2±2.1 days and 42.3±0.3 kg, respectively. For both characteristics, these values were found much higher than values (52.2±3.3 days and 21.5±06 kg) obtained Holstein Friesian cattle by Yılmaz and Kaygısız (2000) and values (26.1±1.1 days and 15.4±0.7 kg) obtained Zavot cattle by Yüksel (2019). This study determined that the milk flow rate was 2.0±0.0 kg/min and milking time was 360.9±4.7 seconds (Table 4). In terms of the milk flow rate, value of the study was higher than the value (1.049±0.019 $kgmin^{-1}$) that Güler et al. (2009) found in Holstein Friesian cattle and value (0.972±0.013 kg min^{-1}) that Aydin et al. (2008) found in Brown Swiss cattle. In terms of milking time, the value found in this study was also higher than the values found in same studies (5.83±0.07 min and 5.46+0.05 min, respectively).

This study determined the heritability of ME-305-d milk yield as 0.41±0.24. This heritability value was higher than the values reported in Holstein Friesian breed cattle (0.26±0.07) by Sarar and Tapki (2017), in Jersey breed cattle (0.30±0.10) by Missanjo et al. (2013), in Holstein Friesian cattle at the first lactation (0.28±0.05) by Bohlouli et al. (2015), and in Holstein Friesian cattle (0.325±0.222) by Güngör and Zulkadir (2020). Milk flow rates based on objective measurements of milk meters have higher heritability values between 0.27 and 0.54 $kgmin^{-1}$ (Ilahi and Kadarmideen, 2004; Gray et al., 2011). In this study, milk flow rate heritability was determined as 0.51±0.30. This value was higher than the value obtained as 0.48 by Wethal and Heringstad (2019) in Norwegian Red cattle.

5. Conclusion

This study is important in determining Holstein Friesian cows' adaptation ability to Turkish conditions. Because Holstein Friesian cattle are imported to Türkiye from USA and EU countries and are grown in a wide area in Türkiye.

In this study, according to the lactation performance data of Holstein Friesian cows, it is understood that the farm has a professional herd management working for high milk production. It is thought that this success achieved by the farm in high milk yield is due to the exemplary level of general competencies such as herd management, care and feeding.

This dairy farm can be recommended as an example to breeders who have just started their dairy farm in Türkiye and countries with similar environmental conditions and are looking for a model. Although the number of studies on 305-d milk yield is sufficient for the Holstein Friesian breed in Türkiye, there are not enough studies on adaptation ability and milking ability.

Author Contributions

The percentage of the author(s) contributions is presented below. All authors reviewed and approved the final version of the manuscript.

	O.Ş.	İ.Y.	A.K.
C	50	50	
D	50	50	
S			100
DCP	100		
DAI		50	50
L	50	50	
W	50	50	
CR			100
SR	50	50	
PM	100		

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Consideration

Ethics committee approval was not required for this study because of there was no study on animals or humans.

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