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A research on longevity, culling reasons and milk yield traits in between Holstein and Simmental cows

Siyah Alaca ve Simental ineklerde damızlıkta kalma süresi, sürüden çıkarma nedenleri ve süt verim özellikleri üzerine bir araştırma

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ABSTRACT

In recent years, dairy cattle breeders prefer Simental cows due to higher breeding time and lower incidence of disease, although they have lower milk yield than Holstein cows. Thus, the aim of the present study was to investigate longevity, the culling reason and some milk yield traits in between the two breeds to investigate the accuracy of this preference. All data that used were collected from herd (Bursa–Karacabey state farm) records belongs to culling cows in two years (2015-2016) and analysed. Longevity for Holstein and Simmental cows were determined 33.6±1.08 month and 33.7±1.21 month. Average lactation milk yield (LMY), 305 days milk yield (305-dMY) and days in milk (DIM), were found to be 8515.63±196.507 kg, 7517.98±148.289 kg and 403.75±9.575 days respectively for Holstein cows and 6079.75±163.126 kg, 5525.71±117.931 kg and 351.40±8.559 days for Simental cows. While the differences between two breeds in terms of longevity and culling reasons were not significant, Holstein cows had higher milk yield than Simmental cows. As a conclusion, it can be said that Holstein cows is the best choice for dairy breeders in local circumstances.

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ÖZ

Son yıllarda süt sığırı yetiştiricileri, Holstein ırkı ineklere göre daha düşük süt verimli olmalarına rağmen daha yüksek damızlıkta kalma süresi ve daha düşük hastalık insidansı gibi nedenlerle Simental ırkı inekleri tercih etmektedirler. Bu doğrultuda bu çalışmanın amacı, söz konusu tercihin doğruluğunu araştırmak için iki ırk arasında, damızlıkta kalma süresi, sürüden çıkarma nedenleri ve bazı süt verim özelliklerini araştırmaktır. Çalışmada kullanılan tüm veriler Bursa Karacabey TİGEM işletmesinde 2015-2016 yıllarında sürüden çıkartılan hayvanların kayıtlarından elde edilmiştir. Damızlıkta kalma süresi Siyah Alaca inekler için 33.6±1.08 ay ve Simental inekler için 33.7±1.21 ay olarak bulunmuştur. Ortalama laktasyon süt verimi (LSV), 305 gün süt verimi (LSV_{305}) ve sağılan gün sayısı (SGS), Siyah Alaca inekler için sırasıyla; 8515.63±196.507 kg, 7517.98±148.289 kg ve 403.75±9.575 gün, Simental inekler için, 6079.75±163.126 kg, 5525.71±117.931 kg and 351.40±8.559 gün bulunmuştur. İki ırk arasında damızlıkta kalma süresi ve sürüden çıkarma nedenleri arasındaki fark önemli bulunmazken, laktasyon süt veriminin Siyah Alacalarda Simentallere göre daha yüksek olduğu bulunmuştur. Sonuç olarak yerel şartlarda süt sığırı yetiştiricileri için doğru ırk seçiminin Siyah Alaca olduğu söylenebilir.

1. Introduction

While 80% of total milk production in the world depends on cattle and this rate is around 91% in Turkey (FAO 2017). This high rate of cattle in milk production has caused breeding activities to focus on this subject. As a result of breeding activities to increase the milk yield throughout the world, Holstein has become one of the most preferred cattle in the world thanks to high milk yield, perfect udder structure and type. However, while breeding activities tend to increase milk yield of Holstein, there has been decrease in reproduction activity, increase of calving interval, increase in health problems and culling rates and also the longevity has decreased (Yaylak et al. 2015). As the longevity increases - defined as " elapsed time between the first calving and culling from herd" (Powell et al. 1997) - production will also increase due to two main

reasons; firstly the rate of those culling from herd due to low yield will decrease and the rate of old animals with higher milk yield compared to young animals will increase (Sewalem et al. 2008).

Due to the reduction in the longevity, the interest in Holstein cows has gone down in European countries especially and there is a tendency towards breeds like Simmental thanks to relatively higher milk yield, high reproduction performance and low disease incidence with lower need for feed based on lower environmental requirements (Miciński et al. 2014). The same thing happens in Turkey from a different perspective. The current practice to increase meat production in the country has brought the effort to increase the rate of breeds in the population that has a relatively higher milk yield whose calves grow fast. Consequently, investors have prefered Simmental cows with higher meat yield rather than the common Holstein when they invest in milk production, and as a result, the number of Simmental farms have increased.

Accordingly in this study was examined lactation milk yield and longevity for Holstein cows that has been commonly preferred until now and Simmental cows that becomes popular in recent years with increasing meat need, breeders demand and government's support in Turkey. Also, it was examined reasons of culling that conceding longevity is function of culling decisions (Neerhof et al. 2000). The study aims to guide selection of right breed according to the production purpose of breeders and to provide data for practice and to serve as a reference source.

2. Materials and Methods

The research was designed to be carried out in only one herd to minimize environmental factors such as feeding, breeding, etc. For this purpose, data that belongs to 280 cows - Holstein (183) and Simmental (97) - culled from herd between 2015 and 2016 at Bursa-Karacabey state farm that is also a member of the Cattle Breeders' Association of Bursa were used. Milk yield data such as DIM, LMY, 305 dMY and reasons of culling were collected from herd records as well as from data base of Cattle Breeders' Association of Bursa. Longevity was calculated as the period between the date of first calving and date of culling according to herd records.

The animals were grouped according to reasons of culling to identify the reasons of voluntary (low yield, breeding or butchery selling etc.) and involuntary (injury, health problems, reproductive problems, death, body type) culling. However, there was no record of voluntary culling during the examined period. Involuntary culling reasons were classified in 7 different groups. Accordingly, the reasons of involuntary culling and the relevant groups are shown in Table 1.

The data were analyzed by using the General Linear Model Procedure of SPSS 20.0. The following model was used for determination of the effect of breed and lactation number on longevity, reasons of culling and milk yield.

$$y_{ijk} = \mu + g_i + lk_j + e_{ijk}$$

Based on the model, y stands for the phenotypic value with regards to examined feature, μ for overall average, g for breed effect, lk for lactation number effect and e for error. Moreover, study relies on chi-square test to examine the connection between reasons of culling and breeds.

3. Results and Discussion

There was no significant (P>0.05) difference between Holstein and Simmental cows in respect of longevity according to study results (Table 2).

According to a few studies comparing the longevity, Perišić et al. (2009) reported that longevity for Holstein cows was 53.3 months and 78.4 months for Simmental in Serbia while Janžekovič et al. (2009) reported that the longevity duration was 72.5 months and 90.1 months respectively. The studies that were carried out in Turkey showed that the longevity was 34.86 months (Yaylak 2003), 36.8 months (Kara et al. 2010) and 29.04 months (Koç 2017) for Holstein cows. However, there were limited studies on Simmental cows in Turkey, and longevity for Simmental cows was determined as 24.68 months in only research that was conducted by Koç (2017).

The reasons of differences among other studies in different areas in terms of longevity can be listed as the number of evaluated animals, origin of animals, milk yield or the difference between feeding and breeding practice. As a matter of fact, Perišić et al. (2009) reported that the difference in between two breed in terms of longevity is associated with the low milk yield in Simmental cows compared to Holstein. On the other hand, Janžekovič et al. (2009) reported that the longevity is influenced by breeder preferences too and conclude that Simmental cows are given more chances by the breeders compared to Holstein and kept for longer periods which in turn influence the longevity. The striking fact in this study is that Simmental cows demonstrate the same values as Holstein cows contrary to the findings of other studies with regards to longevity although they are in the same environmental conditions and show lower milk yield. The reason is probably associated with number of studied animals or origin of the animals. As a matter of fact, while all of Holstein cows were local breeds, 76% of Simmentals were from abroad.

It was studied whether the culling reasons had any connection with the breed or not, and it was seen that the difference was no significant (P>0.05) (Table 3).

The results show parallelism with a similar study where the reasons of culling were examined between these two breeds by Koç (2017). However, rate of reasons of culling was found to be lower for reproduction diseases compared to other studies (Yaylak 2003; Kara et al. 2010; Brickell and Wathes 2010; Koç 2017). In this case, it can be proposed that the veterinary health practices for planning reproduction such as observing of estrus behavior, artificial insemination, etc. in the herd were made on time and accurately. In general, metabolic diseases and pneumonia were higher for Simmental in the proportional variance of reasons of culling, while skeleton and articular disorders, mastitis, foot disease and reproduction diseases were higher for Holstein. Collier et al. (1982) reported that the severity of environmental factors were determined based on the interaction of environmental factors (breeding, feeding, housing, etc.) and species or breed factor. In this case, can be mentioned that the managerial or physical environment deficiencies rather than breed weakness against environmental conditions as the breed factor was found to be insignificant in this study.

In this study, LMY, 305-dMY, DIM and variations of these values according to lactation number (LN) were examined for each breed. Obtained results are shown in Table 4.

Table 1. Reasons of involuntary culling and their subgroups.

Reasons of involuntary culling	**Groups**
Displacement of abomasum, ketosis, hypocalcemia	Metabolic diseases
Uterus rupture, metritis, dystocia, retained placenta	Reproduction diseases
Foot rot, laminitis, dermatitis	Foot diseases
Fracture, arthritis	Skeleton and articular disorders
Mastitis	Mastitis
Pneumonia	Pneumonia
Other	Other

Table 2. Means (±SE) longevity for Holstein and Simental cows.

		Longevity (month)		
Breed	N	Mean± SE	Min.	Max.
Holstein	183	33.6 ± 1.08	0.10	58.42
Simmental	97	33.7±1.21	6.97	50.04
General	280	36.8±2.60	0	114

Table 3. Culling reasons for Holstein and Simmental cows.

	Holstein	*%*	Simmental	*%*	General	*%*
Metabolic diseases	43	*23*	30	*31*	73	26
Foot diseases	13	*7*	5	*5*	18	6
Reproduction diseases	10	*6*	4	*4*	14	5
Skeleton and articular disorders	43	*23*	16	*17*	59	22
Mastitis	27	*15*	12	*12*	39	14
Pneumonia	44	*24*	29	*30*	73	26
Other	3	*2*	1	*1*	4	1
General	183	*100%*	97	*100%*	280	*100%*

Table 4. Means (±SE) LMY, 305-dMY and DIM according to different breed and lactation number.

	N	Holstein	Simmental	General
LN			***LMY***	
1	82	7498.28 ± 294.965	5502.72 ± 334.121	7060.23 ± 257.647 **A**
2	116	8895.29 ± 292.384	6680.43 ± 272.570	8055.17 ± 230.955 **B**
3+4	82	9319.36 ± 425.436	5621.37 ± 191.947	7740.95 ± 326.832 **AB**
General		8515.63 ± 196.507 **b**	6079.75 ± 163.126 **a**	7621.77 ± 156.367
			DMY_{305}	
1	82	6827.41 ± 223.197	5131.83 ± 239.309	6455.21 ± 197.384 **A**
2	116	7747.74 ± 225.723	5929.41 ± 200.998	7058.03 ± 178.952 **B**
3+4	82	8106.36 ± 319.340	5220.77 ± 136.983	6874.71 ± 248.405 **AB**
General		7517.98 ± 148.289 **b**	5525.71 ± 117.931 **a**	6827.80 ± 119.390
			DIM	
1	82	350.58 ± 14.779	336.33 ± 19.575	347.45 ± 12.275 **A**
2	116	430.64 ± 14.106	380.07 ± 14.462	411.46 ± 10.543 **B**
3+4	82	434.98 ± 20.140	323.11 ± 9.208	387.23 ± 13.602 **AB**
General		403.75 ± 9.575 **b**	351.40 ± 8.559 **a**	385.62 ± 7.074

[a,b] Row means of breed with different superscript differ significantly at P<0.01.
[A,B] Row means of LN with different superscript differ significantly at P<0.01.
LN: lactation number, LMY: lactation milk yield, 305-dMY: 305 days milk yield, DIM: days in milk.

It can be seen that there are differences between two breeds as well as lactation numbers for three parameters (P<0.01). DIM was shorter in Simmental compared to Holstein while LMY and 305-dMY were lower. Once the values are examined based on lactation number, it can be seen that lactation number is effective on DIM, LMY and 305-dMY, and the said values also increased as LN increased (P<0.01).

From the examination of sub-groups pertaining to LMY, it is seen that the change in milk yield in different lactations do not progress the same in different breeds. There was an increase in milk yield together with progressing lactation in Holstein cows. On the other hand, the averages in the first lactation and 3+ lactation in Simmental breed were found quite close to each other, however second lactation average was found approximately one ton higher. In other words, there was non-linear relation between studied breeds and LN. The same counts for 305-dMY and DIM. The possible cause is the presence of significant differences between animals that are culled at different lactations. The low number of animals in sub-groups

played role in making the difference more visible. In addition, the reason can be explained as reflection of difference between these two breeds in specified lactation numbers in respect of milk yield on the reproductive traits. As the milk yield increases, calving interval expands which results in DIM extension. There are many studies showing the negative correlation between high milk yield and reproduction performance (Lucy 2001; Dobson et al. 2008; Walsh et al. 2011). These results are in parallel with international studies in which milk yields of two breeds are compared (Micinski et al. 2014; Janzekovic et al. 2009; Budimir et al. 2011; Toledo-Alvarado et al. 2017). At national literature, on the other hand, there is no reference study where these two breeds are compared for milk yields. However, the study was found to be in parallel with other studies, in which milk yield is compared based on breeds, with regards to the fact that milk yield is higher in Holstein compared to Simmental (Çilek and Tekin 2005; Koç 2006; Özkan and Güneş 2007; Akkaş and Şahin 2008). The striking point in results is that milk yield is much higher in both breeds compared to national and international studies. The reason for such difference might arise from breeding and feeding practices as well as the fact that 68% of animals were at 2nd and 3rd lactation during which milk yield is already high.

4. Conclusions

In conclusion, as pointed out above, it is observed that breeders of dairy cattle in Turkey tend to prefer Simmental cows compared to Holstein lately. Based on the study results, the reason for preferring a breed whose milk yield is lower despite the lack of any difference between the longevity or culling reasons for dairy cattle breeding can only be explained by the preferences of breeders and market conditions. Consequently, it can be concluded that it would be better for breeders to prefer Holstein rather than Simmental in their investments for dairy production, contrary to national tendency, based on the study that was carried out in a herd that is exemplary and pioneer in dairy cattle breeding in the province of Bursa. However, it will be useful to conduct similar studies in more herds with more animals and more comprehensive data set to reduce the margin of error and to reach more accurate and specific conclusions.

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