Scientific Papers. Series D. Animal Science. Vol. LXI, Number 1, 2018
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

DETERMINATION OF HERD MANAGEMENT LEVEL BY SOME REPRODUCTION AND MILK YIELD TRAITS OF SIMMENTAL COWS AT INTENSIVE CONDITIONS IN TURKEY

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Abstract

The aims of this study were to determine some fertility and milk yield traits of Simmental cows under intensive dairy farm conditions in Konya region of Turkey, and to investigate herd management level by these traits. A total of 120 cows constituting the material of the study were grouped by parity (second and third) and calving season (winter, spring, summer and autumn). Two milk yield groups were designed by taking arithmetic average of previous lactation milk yield. The means for number of services per conception (NSC) and service period (SP) were found to be 2.37±0.016 and 92.0±5.32 days, respectively. Also, average daily milk yield (ADMY), and first and second lactation milk yields were determined as 18.7±0.36 kg, 4756±59.41 kg and 5918.7±75.30 kg, respectively. While ADMY values in cows with 3th parity were higher than those with 2nd parity (P<0.01), NSC of cows calved in the spring were found to be lower (2.11±0.15) than those calved in summer (2.90±0.26) (P <0.05). In addition, the SP of cows calved in winter, autumn and spring was found higher than those calved in the summer (P<0.01). The ADMY values cows of calved in the autumn were higher than those calved in the winter and spring (P<0.001) and NSC means were found lower (2.11±0.14) in cows with lower milk yield than those with higher yield (2.79±0.19) in the subsequent insemination period (P<0.01). These results indicate that milk yield was adequate, NSC was high and SP was close to the upper threshold. Finally, it is suggested that herd management indicators should exhaustively be reconsidered by fertility in the investigated dairy farm.

Key words: *Simmental, fertility, management, milk yield.*

INTRODUCTION

In recent years, herd size and intensification process in dairy farms have increased rapidly (Uzmay et al., 2010). Therefore, herd management strategies have importance in terms of continuity of herd and sustainable production in the dairy enterprises produced in intensive conditions. Considering that milk production of the main source of income of these enterprises is also taken into consideration, it is essential to attain ideal milk production from each cattle and calves per year (Uygur, 2004; Yüceer and Özbeyaz, 2010; Erez and Göncü, 2012). Milk and fertility traits having economic value are mostly influenced by herd management (Ozcelik and Arpacık, 2000; Uygur, 2004). Thus, knowing the traits of fertility and milk yield, which are part of herd management, have been regarded as the important indicators for proper herd management (Bolacali and Öztürk, 2017). Also, some researchers informed that controlling the reproductive performance traits of cattle implies more calf and milk production throughout the life (Uygur, 2004; Tekerli and Gündoğan, 2005; Erdem et al., 2007; Bayrıl and Yılmaz, 2010).

The increase in the numerical values of the fertility traits such as service period (SP), number of services per conception (NSC), calving interval (CI), and first calving age (FCA) affect the production costs of enterprises in a negative way. Besides, these traits can also be affected by environmental factors such as parity, calving season and milk yield (Rafique et al., 1999; Ural, 2012). This circumstance demonstrates the importance of determination of fertility and milk yield traits for dairy enterprises. To this aim, Çilek and Tekin (2005) calculated 305-day lactation milk yield, SP and NSC of Simmental cows reared intensive conditions in Turkey as 4700±69.2kg, 93.9±2.03d and 1.76±0.04, respectively. Besides, positive correlations between 305-day milk yield and SP ($r=0.17$; P<0.001) or NSC ($r=0.09$; P<0.05) were estimated. In a similar study that conducted by Bolacali et al. (2017),

average SP and NSC were determined as 116.41±1.43d and 1.75±0.03, respectively. Morever, calving season of cows were found to be effective on SP (P<0.01) and NSC (P<0.05), while parity was only significant on NSC (P<0.001).

Until now, many studies have aimed to determine fertility and milk yield traits. Since these parameters are considered to be a consequence of herd management, determination of these elements in large herds is important for solving the problems in the current husbandry practices. Also, it is believed that herd management elements will be beneficial to maximize the genetic capacities of cows and to constitute profitable production infrastructures. The objectives of this study were to determine some reproductive and milk yield traits of Simmental cows reared under private enterprise conditions and to examine the herd management situation of the enterprise in terms of these traits.

MATERIALS AND METHODS

In this study, a total of 120 Simmental cows reared under intensive dairy farm conditions in Konya region of Turkey was investigated. While SP and NSC values of cows belonging to 2014-2017 years were chosen as the milk yield traits, average daily milk yield (ADMY) and lactation milk yield (LMY) of cows in this period were used as the milk parameters. Besides, the calving season and parity of cows in the dairy enterprise were also recorded. Relevant milk and fertility records were recorded with computer-aided herd management system in the enterprise. The cows chosen as the experimental material were grouped by parity (2nd and 3rd lactation) and calving season (autumn, winter, spring and summer). Also, a single value was obtained by taking the arithmetic mean of previous lactation milk yields (5918.7±75.30 kg) of the cows. Those with low values from the mean were classified as the first group (Group-1: 4502.9±42.65 kg) and the high values were taken to the second group (Group-2: 6666.0±104.48 kg). Milk yield, parity, and calving season were grouped as above and the effects of these factors were investigated by using variance analysis technique.

The following mathematical models were applied:

For SP and NSC: $Yij=\mu+ai+eij$

where, Yij: μ: population average, ai: i. effect of the milk yield groups, i= low yield (Group-1), high yield (Group-2), and eij: random residual term.

For SP, NSC and ADMY: $Yij=\mu+ai+bj+eijk$

where, Yijk: μ: population average, ai: i. effect of calving season (i= autumn, winter, spring and summer), bj: j. effect of parity (j=2, 3), and eijk: random residual term.

Effect of milk yield on NSC and SP, and effect of lactation number on SP, NSC, and ADMY were revealed by independent simple *t-test*. In addition, the effects of the calving season on SP, NSC and ADMY were determined by one-way ANOVA. In the all statistical analyses, SPSS 20.0 program was used.

RESULTS AND DISCUSSION

In this study, mean lactation milk yields of Simmental cows reared in intensive conditions were found as 5918.7±75.30 kg (Table 1). These results were found lower than the findings of Koc (2011); Erdem et al. (2015); Kucuk-Baykan and Ozcan (2017), and higher than the findings of Cilek and Tekin (2005); Ozkan and Gunes (2007) and Kocak et al. (2008). Differences in the obtained findings might be caused by the variation in the environmental factors in the rearing conditions, and various genetic potential levels of the animals.

Table 1. Lactation milk yield by groups

	n	Lactation Milk Yield (kg)
Group 1	71	4502.9±42.65
Group 2	49	6666.0±104.48
Mean	120	5918.7±75.30

The means (±SE) of NSC and SP values from the examined reproductive traits were found as 2.37±0.12 and 92.0±5.32d, respectively (Table 2). In the similar studies those conducted in Turkey conditions, Cilek and Tekin (2005), Erdem et al. (2015) and Bolacali et al., (2017) calculated the means of these paremeters to be 1.76±0.04/93.9±2.03d; 1.96±0.05/92.8±1.46d and 1.75±0.03/116.41±1.43d, respectively. As seen, the findings obtained here for NSC were found to be higher than the values reported by Cilek and Tekin (2005), Erdem et al. (2015)

and Bolacali et al. (2017). However, the values determined for the other reproductive performance SP were found lower than the findings of Bolacali et al. (2017), while agreement with the results of the studies conducted by Cilek and Tekin (2005) and Erdem et al. (2015). According to these results, it can be mentioned that SP values were close to the upper limit of the acceptable levels for the enterprise in which the study were conducted. However, the results obtained for NSC were found as higher than the normal values. In this sense, rechecking insemination and detection of estrus applications in the herd might especially be advised. In this study, LMY affected NSC (P<0.01) but not affected SP (Table 2). The average NSC of cows with high LMY (2.79±0.19) was found to be higher than those with low LMY (2.11±0.14). Cilek and Tekin (2005) reported the positive correlations between milk yield and NSC or SP values. Based on these findings, it can be said that high milk yield had a negative effect on some reproductive traits. This case might be attributed to the changes in the endocrine system of cows and reduction in the immunity due to physiological stress (Nebel, and McGilliard, 1993; Cilek and Tekin, 2005; Walsh et al., 2011).

Table 2. Means (±SE) of NSC and SP by LMY groups

	n	NSC**	n	SP
Group 1	65	2.11±0.14	47	87.9±6.57
Group 2	42	2.79±0.19	27	99.1±9.05
Mean	107	2.37±0.12	74	92.0±5.32

** P<0.01; NSC: number of services per conception; SP: service period; LMY: lactation milk yield

In this research, no significant effect of parity on NSC and SP was obtained (Table 3). These findings were in agreement with the results of Cilek and Tekin (2005) and Ural (2012). However, Bolacali et al. (2017) reported that effect of parity on SP was not statistically significant, but effective (P <0.001) on NFC.

As seen in Table 3, ADMY of cows in the second lactation (15.5±1.15 kg) were lower than those in the third lactation (19.1±0.35 kg). Based on these results, it is possible to point out that ADMY parallelly increases with advancing parity. As well known, the increase of LMY and ADMY of cows continues until reaching mature age (5-6 years). Really, the increase in the ADMY might be assumed as an expected result when parities of the cows in this study were regarded.

The reports of Ozcelik and Arpacik (2000), Akman et al. (2001) and Ozkan and Gunes (2007) also support this study.

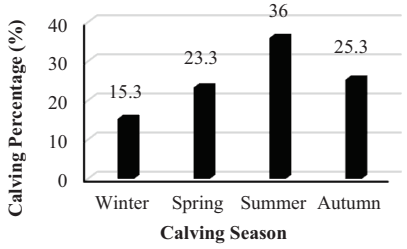

Figure 1. Change of calving percentage by seasons

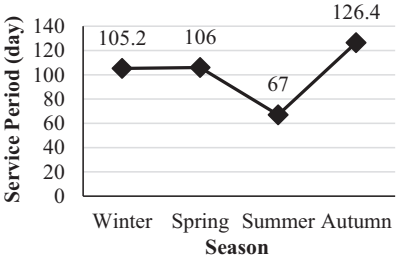

Figure 2. Changes of service period by seasons

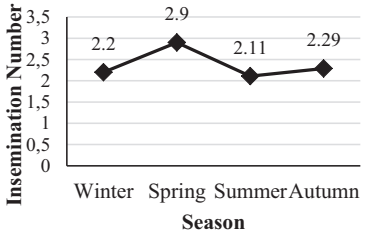

Figure 3. Changes of number of services per conception by seasons

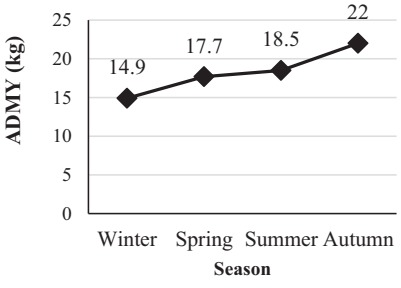

Figure 4. Changes of average ADMY (daily milk yield) by seasons

As seen in Figure 1, it was observed that the highest calving rate occurred in summer (36%) while the lowest percentage was obtained in winter (15.3%). In contrast, SP values of cows calved in summer were lower than those calved in the other seasons (P<0.01) (Figure 2). Findings obtained in this study are similar to results acquired by Bolacali et al. (2017). Contrary to these results, Cilek and Tekin (2005) found that calving season was only effective on NSC (P <0.05). However, while the lowest NSC (2.11±0.15) was found in cows calved in summer, the highest value (2.90±0.25 was obtained from cows calved in spring (Figure 3). Besides, it was determined that cows calving in the autumn months had higher (P<0.001). ADMY values than those of calving in the winter and spring (Table 3, Figure 4). Finally, it is possible to say that milk and fertility traits are markedly affected from calving season.

CONCLUSIONS

As a result, cows with higher lactation milk yields had higher NSC values than those with lower yields.

While parity was important for ADMY, calving season had a significant effect on both reproductive and milk yield traits.

The percentage of calving in the present enterprise was higher in summer than that determined in the other seasons.

When all results here are evaluated as a whole, it is considered that the milk yield level of Simmental cows reared in intensive conditions was adequate.

High NSC and close to the upper threshold of SP indicated that herd management strategy by reproductive traits in the investigated dairy enterprise should be rechecked.

Table 3. Means of NSC, SP and ADMY values by parity and calving season

Parity	n	NSC	n	SP	n	ADMY**
2	36	2.62±0.23	24	100.4±8.38	12	15.5±1.15
3	81	2.30±0.13	50	88.0±6.75	91	19.1±0.35
Mean	107	2.37±0.12	74	92.0±5.32	103	18.7±0.36
Calving Season		*		**		***
Winter	15	2.20±0.26 ^{ab}	15	105.2±15.75^{b}	8	14.9±1.18 ^{a}
Spring	31	2.90±0.25 ^{b}	22	106.0±9.19^{b}	29	17.7±0.57 ^{a}
Summer	47	2.11±0.15 ^{a}	30	67.0±4.78^{a}	46	18.5±0.44 ^{ab}
Autumn	14	2.29±0.34 ^{ab}	7	126.4±13.78^{b}	20	22.0±0.77 ^{b}

*P<0.05; ** P<0.01; *** P<0.001

NSC: number of services per conception; SP: service period; ADMY: average daily milk yield

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