Journal of Animal and Veterinary Advances 7 (7): 808-811, 2008
ISSN: 1680-5593

Reproductive and Milk Production Traits of Holstein Friesian Cows in Pre-Organic and Organic Dairy Husbandry in Turkey

[1]Bahri Bayram, [2]Mete Yanar and [2]Ömer Akbulut
[1]Department of Organic Agriculture, Aydın Dogan Vocational Training School,
Erzincan University, Kelkit, Gümüshane, 29600, Turkey
[2]Department of Animal Science, College of Agriculture, Atatürk University, Erzurum, 25240, Turkey

Abstract: The study was aimed to describe changes caused by conversion to organic dairy farming in Turkey, focusing on reproductive and milk production traits. The data used in this research were obtained from reproductive and milk records of Holstein Friesian cows reared in a private organic dairy farm. The results revealed that cows under organic management had shorter days open and calving interval values compared with cows reared under pre-organic system. Actual and 305 days milk yields of cattle in organic system were greater than these of cows in pre-organic system. Lactation duration was also significantly influenced by farming system and calving season, but days dry was not affected by none the non-genetic factors.

Key words: Organic dairy production, milk yield, reproductive traits, holstein, cow

INTRODUCTION

In recent years, organic milk production is gaining increasing interest from dairy cattle producers worldwide and especially in Europe, since consumers in these countries demand high quality, safe food that is produced with minimal environmental losses, under optimal conditions for animal health and welfare. Organic milk production is practised according to European and national regulations on organic farming. First organic dairy cattle farm in Turkey was established in Kelkit county of Gümüshane province located in Eastern Black Sea region of the country in 2003. At the beginning, pregnant heifers from conventional dairy farms in Wisconsin, USA were brought to the farm and they were reared in the farm under pre-organic dairy farming conditions for 2 years. Later, the farm was converted to organic production in 2005.

The purpose of this study was to describe changes prompted by conversion to organic dairy farming, focusing on milk production and reproductive traits.

MATERIALS AND METHODS

The data used were milk production records and accompanying reproduction records of Holstein Friesian cows reared in a private organic dairy farm, Kelkit, Turkey. In this farm, conversion to the organic milk production was completed in 2005. Therefore, data collected between 2003 and 2004 were called as pre-organic data and records obtained after 2005 were named as organic data. Practices of the organic dairy cattle rearing are based on a combination of general principles and detailed rules of organic milk production as indicated in the Organic Farming Law printed in Turkish Republic Official Gazette (Anonymous, 2002).

Alfalfa, sainfoin, common vetch corn and barley are produced organically in this farm without using chemical fertilizer. Corn, common vetch are utilised for production of silage. The silage, organic dry meadow hay and organic dry alfalfa are used in the diet of the animals as sources of the roughage. According to the regulations for organic dairy cattle rearing in Turkey, the ration of the cows can contain 60% of roughage and 40% of concentrate. In other words, a diet in organic dairy farming predominantly has to be based on roughage (Hass *et al*., 2007).

Holstein Friesian cows were milked three times in a day during 3 weeks of postpartum. Later, they were milked twice in a day. After milking, daily milk yield was recorded by a computer system that can recognize each cow by using transponders carried by each animal. Actual and 305 days lactation milk yield of the cows were calculated from the daily milk yield records.

Production traits in the study were analysed using the following mathematical model:

Corresponding Author: Bahri Bayram, Department of Organic Agriculture, Aydýn Dogan Vocational Training School, Erzincan University, Kelkit, Gümüshane, 29600, Turkey

$$Y_{ijkl} = \mu + a_i + b_j + c_{jk} + e_{ijk}$$

Where,

Y_{ijkl} : Actual lactation milk yield, 305 days milk yield, lactation duration, dry days, days open; number of services per conception.
μ : Overall mean.
a_i : Effect of season (i: Winter, Spring, Summer, Fall)
b_j : Effect of the farming system (j: pre-organic, organic).
c_{jk} : Effect of the parity nested within farming system (farming system-parity: 1-1, 2-2, 2-3).
e_{ijk} : Residual.

Statistical analysis was carried out by SPSS statistics package program (SPSS, 2004).

Since, the pregnant heifers were imported from abroad to this organic farm, only descriptive information about some reproductive traits such as first conception age and age at first calving could be calculated by SPSS program. On the other hand, the number of services per conception for cows reared under pre-organic period could not evaluated due to absence of their data about this trait.

RESULTS AND DISCUSSION

Descriptive data about the reproductive traits of the organic farm revealed that first conception age and age at first calving were 20.7±0.3 months and 29.9±0.2 months respectively. The data were as results of the feeding and management practices of the conventional farms in Wisconsin, USA, where the pregnant heifers were brought to this organic farm in Turkey. The results were in agreement with findings of studies carried out in the other conventional dairy farms (Bakir and Cetin, 2003; Tuna *et al.,* 2007), but, higher than findings of Duru and Tuncel (2002).

east squares means for days open was significantly influenced by organizations, calving season and parity (Table 1). Cows under organic management experienced fewer days open ($p<0.01$) compared with cows under pre-organic system. The result is in accordance with findings of Reksen *et al.* (1999) who reported shorter days open ($p<0.05$) in organic husbandry compared with conventional management. The longest days open value was obtained from cows calved in fall season. Ozcelik and Arpacik (1996) and Asimwe and Kifaro (2007) indicated the significant effect of the calving season on the days open. Additionally, days open decreased as long as parity advanced and the shortest value was obtained from cows in third parity group. Significant influence of the parity was also reported by Ghafarizadeh *et al.* (2005).

Calving interval was significantly ($p<0.01$) affected by farming system and calving season (Table 1). The lowest ($p<0.01$) calving interval value was obtained from cows in organic system compared with these in pre-organic system. Similar finding was reported by Reksen *et al.* (1999) who found that calving interval of Holstein cows reared under organic husbandry was significantly ($p<0.05$) less than these reared under conventional husbandry. Calving season also significantly ($p<0.01$) affected on calving interval. The result is in agreement with findings of Mansour (1992) and Asimwe and Kifaro (2007).

Number of services per conception of cows under organic dairy farming conditions was significantly influenced by calving season and parity (Table 1). The lowest number of services per conception was determined form cows calved in winter. Similarly, Haile-Mariam and Makonnen (1996) and Ageeb and Hayes (2000) reported significant effect of the calving season on the number of services per conception of Holstein cows.

Least squares means for actual milk, 305 days milk, lactation duration and days dry are presented in Table 2. 305 days milk yield was significantly ($p<0.01$) affected by

Table 1: Least squares means with standard errors for days open, number of services per conception and calving interval of Holstein Friesian cows

	Days open		Number of services per conception		Calving interval	
	n	S.D.	n	S.D.	n	S.D.
General	505	158.9±5.3	294	2.3±0.1	624	427.0±4.4
Calving Season		**		**		**
Winter	258	151.4±6.0^b	86	1.8±0.1^c	295	421.9±4.5^b
Spring	172	144.9±6.1^b	126	2.1±0.1^b	217	414.9±4.8^b
Summer	46	141.4±11.6^b	61	2.8±0.1^a	81	404.0±9.3^c
Fall	29	197.9±14.6^a	21	2.6±0.2^a	31	467.1±12.4^a
Farming System (FS)		**				**
Pre-organic	287	178.1±6.8^a	-	-	328	444.6±5.6^a
Organic	218	149.3±6.4^b	294	2.3±0.1	296	418.2±5.1^b
FS-Parity		*		**		
Pre-organic-1	287	178.1±6.8	-	-	325	444.6±5.6
Organic-2	152	154.0±6.6	210	2.6±0.1	213	422.1±5.1
Organic-3	66	144.6 ±10.1	84	2.1±0.1	31	414.3±8.1

*p<0.05, **p<0.01

Table 2: Least squares means with standard errors for actual milk yield, 305 days milk yield lactation duration and days dry of Holstein Friesian cows

	Actual Milk Yield (kg)				Days Dry (d)	
	n	S.D.	305 days Milk Yield (kg)	Lactation Duration (d)	n	S.D.
General	667	7497.9±120.7	6979.6±108.8	369.0±4.0	623	67.1±2.2
Calving Season			**			
Winter	347	7294.9±129.1	6852.6±116.3	358.1±4.2[b]	328	69.4±2.3
Spring	224	7197.3±136.1	6767.9±122.63	55.5±4.5[b]	205	63.8±2.5
Summer	61	7543.5±257.6	7156.5±232.2	350.0±8.4[b]	55	65.3±4.8
Fall	35	7956.0±338.3	7141.3±305.0	412.3±11.1[a]	35	70.0±5.9
Farming System (FS)		**	**			
Pre-organic	358	7330.4±153.3	6644.5±138.2[b]	393.4±5.0[b]	328	63.8±2.8
Organic	309	7581.7±144.2	7147.1±130.0[a]	356.7±4.7[a]	295	68.7±2.6
FS-Parity				**		
Pre-organic-1	358	7330.4±153.3	6644.5±138.2	393.4±5.0	328	63.8±2.8
Organic-2	225	7456.6±142.6	6961.4±128.6	365.7±4.7	216	66.3±2.5
Organic-3	84	7706.8±229.6	7332.8±206.9	347.9±7.5	79	71.3±4.1

* $p<0.05$, ** $p<0.01$

the farming system. 305 days milk yields of Holstein cows under pre-organic and organic systems were 6644.5 and 7141.1 kg, respectively. The result is different from findings of Sato *et al.* (2005) and Roesch *et al.* (2005) and Nauta *et al.* (2006) who concluded that means for milk yield of organic farms were lower than these of conventional farms, after they compared lots of organic and conventional dairy cattle farms. In the present study, primiparous cows were reared under pre-organic husbandry. Later, the cows in second and third parity were reared under organic dairy farming system. Increasing 305 days milk yield under organic farming conditions could be due to advancing of the parity of the cows rather than influence of the farming systems.

Farming system, calving season and parity had significant ($p<0.01$) effect on the lactation duration of Holstein Friesian cows (Table 2). Average lactation duration in this farm was longer than standard lactation length. Especially the value (393.4 days) in pre-organic period was too long and the result might be attributed to some problems causing the delay of the conception. Lactation duration of cows calved in fall had the longest duration of lactation. Similar effect of the calving season was also reported by Parra-Bracamonte *et al.* (2005).

CONCLUSION

Results of the study revealed that cows under organic management had shorter days open and calving interval values compared with cows reared under pre-organic system. Actual and 305 days milk yields of cattle in organic system were greater than these of cows in pre-organic system. The result was mostly related with advancing parity rather than farming systems. Lactation duration was also significantly influenced by farming system and calving season, but days dry was not affected by none the non-genetic factors.

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