



## The effect of offspring factor on cow milk components having economic importance

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Article published on July 30, 2018

**Key words:** Offspring, Cow, Milk, Component.

### Abstract

The study was performed in order to learn the effect of offspring factor (birth type and sex) in dairy cows on milk components having economic importance such as fat and protein. Milk samples were collected from 24 Red Holstein cows. Milk samples for once were collected from dams in first week of postpartum period. According to results of study, sex of offspring doesn't have an influence on milk components having economic importance. However, it was found that birth type (single or twins) had a significant effect on milk fat rates. It was found that milk fat rates of dams having twin calves were lower than that of dams giving birth to singles in postpartum period.

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## Introduction

Little is known about related factors with offspring and their interrelationships with milk constituents having economic importance such as fat and protein in the postpartum and early lactation period. Milk fat and protein have traditionally received more attention in dairy sector (Grant, 2007). Knowledge on milk components having economic importance is important for management of dairy dams (Glen, 2004). Milk protein and fat has economic value because higher protein leads to higher milk products such as cheese, yoghurt etc. (Cicek, 2007). These components are therefore called economic parameters. These components impact product development and international trade of dairy products. Recently, researches focus on milk parameters having economic importance such as fat and protein (Weiss, 2012; Boerman, 2013).

It was reported that milk composition was affected by animal factor having different characteristics because they have different autocrine control of milk secretion (Wilde *et al.*, 1998). The relationships between milk components having economic importance and animal factors are also useful in studying the economy of milk and component production.

Animals delivering female calves produce more milk and its components than those delivering male calves (Gillespie *et al.*, 2017). Differences of hormonal levels in udder of dams having different birth type and sex can affect milk component synthesis, possibly through difference of mammary gland development in dams. According to findings of Çakır and Çimen (2016), the offspring factor affects the some milk components such as lactose in dairy goats.

Therefore, this factor should be taken into account when interfering with milk components in dairy cows. However, there is little knowledge in literature between milk components having economic importance and offspring factor. This study was conducted for to learn the effect of birth type and sex of calves on milk parameters having economic importance such as total fat and total protein and to fill the gap in literature.

## Material and method

### *Animals*

In total, 24 Red Holstein cows selected from a special dairy farm. Birth type groups were formed that 6 cows giving birth to twins and 6 cows giving birth to single. Similarly, birth sex groups were formed that 6 cows giving birth to male and 6 cows giving birth to female.

### *Milk analyses*

Milk samples were collected from 24 Red Holstein cows. Milk samples for once were collected from dams first week of postpartum period. Milk samples were composites of milk collected at consecutive morning and afternoon. Hand milking was performed to sterilized bottles. Approximately 100ml milk sample was taken for total fat and protein analysis and it was transferred to the laboratory in a short period. The milk analysis was carried out by means of Milkana milk analysis device.

### *Statistical analysis*

For the statistical analyses of experimental data, independent two sampled t test method was used in the study (Norusis, 1993). It was performed a normality test on the data (Çimen, 2015). The all data of different groups were presented as mean  $\pm$  standard error. Comparisons were done with help of the SPSS 18 statistical program.

## Result and discussion

### *The effect of offspring sex*

The fat and protein contents have been noted between the different groups as presented in Table 1 and Table 2.

Milk fat rates in the dams having male and female calves were 3.41 and 3.43%, respectively (Table 1). There were no statistically differences between groups ( $p > 0.05$ ).

The Table 2 shows a comparative report of the milk protein rates of the different groups. In the study, there were no differences in terms of the milk protein rates of both groups (Table 2). As shown the Table 1 and Table 2, milk total fat and protein rates of the dams giving birth to female and male calves have statistical similarities. Hormones produced by the fetus are able to cross the placenta, and offspring sex has been pointed out to impact hormonal threshold in the dam (Ivel *et al.*, 2002).

Differences in the abundance of hormones involved in lactogenesis may influence milk and component secretion in udder of dam that giving birth to male or female calves. The sex of the calf may have an effect on milk and its component production in all later lactation periods if differences in abundance of a hormone influence mammary development, whereas the findings of our studies do not support these expectations on calf gender. According to findings in the research, it can be said that offspring sex doesn't have an influence on milk components having economic importance such as protein and fat. The observed milk components of all dams were similar with respect to milk fat and protein rates of healthy dairy cows (Koneko and Cornelius, 1980).

**Table 1.** The effect of offspring sex on milk fat rates.

Birth Type	Mean (%)	Standard Error	p
Male	3.41	0.69	0.123
Female	3.43	0.72	

**Table 2.** The effect of offspring sex on milk protein rates.

Birth Type	Mean (%)	Standard Error	p
Male	3.21	0.11	0.094
Female	3.20	0.13	

*The effect of birth type*

The means and standard errors of total fat and protein rates for different groups in this study appear in Table 3 and 4. Milk fat rates in the dams having single and twin calves were 3.47 and 3.32%, respectively (Table 3). Data in Table 3 indicate that the effect of offspring sex on milk fat rates. Milk fat rate in single group were statistically higher than that of twin group ( $p=0.032$ ). According to findings associated with lower milk fat production in dams having twin calves, we can say that differences in the hormones associated with milk component secretion in dams having different birth type may change generating of milk fat levels in udder of dams. Milk protein rates for different birth type groups are presented in Table 4. Milk protein rates in the dams having single and twin calves were 3.22 and 3.20%, respectively (Table 4). There were no statistically differences between groups ( $p>0.05$ ).

According to result of total protein rates in Table 4, differences in the hormones associated with milk component production in dams having different birth type were not change generating of milk protein secretion in udder.

**Table 3.** The effect of birth type on milk fat.

Birth Type	Mean (%)	Standard Error	p
Single	3.47	0.09	0.032
Twin	3.32	0.12	

**Table 4.** The effect of birth type on milk protein.

Birth Type	Mean (%)	Standard Error	p
Single	3.22	0.18	0.221
Twin	3.20	0.23	

According to our results, it was specified that birth type of dairy dams had an influence on milk fat rates but sex of offspring didn't have an influence on all milk constituents having economic importance. Cows calving twins produce less milk during the subsequent lactation compared with cows calving singles (Nielenet *al.*, 1989). The relationships between milk fat and milk yield characteristics were negative (Alphonsus and Essien, 2012).

According to this information, low milk production in dams having twins may be the reason why milk fat rates were low in this group. Differences in hormonal levels in dams having different birth type affect milk fat synthesis, possibly through difference of mammary gland development in dams. Although differences in hormones can cause change of milk component production associated with birth type, the change of fat rates in dams having different birth type is more likely to be due to other effects that have been shown to affect milk yield such as birth weight, lactation length, feeding management. Confirming the study findings in study with other dairy cow breeds will be useful. In case of similar findings to be collected from future studies, it should be studied that why twin birth type in dairy dams has an influence on milk total fat rates. Knowledge related to milk fat levels for different animal and environmental factors is still sparse in literature. According to findings in our study, preferring the milk of dams giving birth to single offspring can be relatively advantageous for economic benefits from total fat.

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