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# EFFECT OF ESTRUS ON MILK YIELD AND COMPOSITION IN JERSEY COWS

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## Abstract

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This study was performed to demonstrate the effect of estrus on milk yield and composition in Jersey. In this study, 15 jersey cows which were at the same estrus period, in the third lactation period and breeding under uniform housing and feeding conditions were selected. Milk production was calculated by sampling milk at the evening hours in the estrus period and 3 days after the end of estrus period. Acidity, pH, density, dry matter, fat and lactose levels, were determined from the obtained milk samples in evening milking. In this study, milk yield of cows in estrus was determined as 4.8 kg while post estrus production elevated to 5.8 kg ($P<0.01$). Conversely, it was determined that the estrus does not significantly affect compound of the milk ($P>0.05$). High positive correlation between dry matter and fat content ($r = 0.673$) in estrus period was detected. In post estrus correlations between milk composition; negative ($r = -0.755$) between pH and lactose and positive ($r = 0.755$) phenotypic correlation between dry matter and density were determined. In conclusion, it was indicated that estrus has been important effect on milk yield while does not have a significant effect on milk composition.

*Key words:* estrus, Jersey cattle, lactose, milk fat, milk yield

## Introduction

In animal breeding, the major goal is to achieve a profitable production by increasing the output per animal. In a dairy farm, profit can be realized by reaching maximum milk amount related to genotypic structure. Genetic structure of the animal and many environmental factors are important in reaching the highest milk amounts (Akcapinar and Ozbeyaz, 1999). Milk yied is affected by factors such as breed, age, season, management, daily milking number and pregnancy. Composition of milk is affected by these factors nearby milk yields (Duru and Tuncel, 2002). Besides these long term effects, short term effects such as incomplete milking, diseases and estrus are effective over milk amount and composition (Ozcan and Yalcin, 1985).

Several studies have indicated that estrus period could be detected by checking certain lactation yields (total milk production) or have been milk yields in

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(Cowan and Larson, 1979; Van Eerdenburg et al., 2002) and also could via near period on estrus and determining estrogen concentration in milk (Lopez et al., 2002; 2004; 2005). Generally, there were reported that milk yields during estrus periods are decreasing (Erb et al., 1952; King, 1977; Cowan and Larson, 1979; Akcapinar and Ozbeyaz, 1999; Lopez et al., 2002; 2005), whilst fat concentration in milk is increasing (Erb et al., 1952; King, 1977; Cowan and Larson, 1979). Studies comparing milk components during and after estrus periods represent different results. Sekerden et al. (1992) reported that some milk components (Lactose and dry matter) are increasing during estrus. However other components are decreasing (King, 1977; Sekerden et al., 1992). However, Cowan and Larson (1979) observed that no important change in the milk components occurs during estrus period. Although no importance was reported about the effect of breed on variation of milk production during estrus periods, Jersey was tended to be more variable during these periods (Cowan and Larson, 1979). The mean fat content, dry matter and lactose concentration of milk gathered from Jersey cows which gives 3000 kg milk per lactation is 5.05 %, 14.54 % and 5.0 % respectively (Ozhan, 1992).

In many countries, failure in detecting exact time of estrus is responsible for the economic losses. Therefore, there is a need to clarify if changes in milk yield and milk components during estrus period could be used as an indicator for estrus detection. Since this issue needs to be investigated, in this study it was aimed to determine variations of milk yield and milk components at estrus period in Jersey cattle.

## Material and Methods

In this study, 15 Jersey cows in the third lactation, breeding at Karakoy State Farm at the Samsun city, Turkey, were used. According to the inspection of farm records belonging to 350 jersey cows, 15 Jersey cows were selected at the same age, same lactation number and at their third lactation period. All cows are in second estrus period observed from June to July at post partum. Estrus detection was performed using a pedometer system and by visual observation of typical estrus behavior. They were milked at evening time during estrus periods and also were milked after three days from estrus called as meta-estrus period. Milk yields were measured by portable milking machine, observing milk yields were weighted and calculated as milk yields for both estrus and post-estrus periods.

Milk density and pH was determined with a lactodensimeter and pH meter (WTW, Inolab Level 1, Germany), respectively. Titratable acidity of milk samples were measured, and values were reported as lactic acid % (L.A. %). Dry matter and fat level were determined using hand refractometer (N.O.V.A) and Gerber butyrometer, respectively. Lactose content of milk was measured by using Photometric technique. Management conditions were stable during the study. Cows were on pasture during the day and were fed supplemental grass and hay at night between June and July.

### *Statistical analyzes*

In this study, paired-t test was applied to determine the difference in milk yield and composition between estrus and post-estrus period. Furthermore, Pearson-correlation test was applied to determine the phenotypic correlation coefficients between milk yield, pH, acidity, density, dry matter, fat and lactose levels of milk in estrus and post estrus period (SAS, 2008).

## Results and Discussion

Means of milk yied and composition at estrus period and at post estrus period in Jersey cows are presented in Table 1. While the average milk amount of evening milking were 4.8 kg during estrus period, this value increased to 5.8 kg at post estrus period ($P<0.01$).

In Figure 1, daily individual variations between estrus period and post estrus period of each animal are presented. Milk yield shows a tendency to increase during post estrus period when compared by estrus period (King, 1977; Cowan and Larson, 1979; Lewis and Newman, 1984; Walton and King, 1986;

**Table 1**
**Milk yield and composition in estrus and post-estrus period (Mean ± S.E.)**

| Traits | Estrus | Post-estrus | t value |
|---|---|---|---|
| Milk Yields (kg)* | 4.8 ± 0.440 | 5.8 ± 0.450 | 3.37** |
| pH | 6.58 ± 0.070 | 6.67 ± 0.029 | 1.1 |
| Acidity (%L.A.) | 0.15 ± 0.005 | 0.13 ± 0.015 | -1.29 |
| Dry Matter (%) | 9.33 ± 0.151 | 9.29 ± 0.150 | -0.44 |
| Density | 1026.47 ± 0.533 | 1025.70 ± 0.310 | -1.53 |
| Fat (%) | 4.26 ± 0.330 | 4.84 ± 0.210 | 1.54 |
| Lactose (%) | 4.75 ± 0.084 | 4.65 ± 0.090 | -0.76 |

*Average milk production in evening milking
**P <0.01

**Table 2**
**Correlation of milk yield and composition during estrus**

| | Milk Yield | pH | Acidity | Dry Matter | Density | Fat | Lactose |
|---|---|---|---|---|---|---|---|
| Milk Yield | 1 | -0.02 | -0.126 | 0.152 | -0.268 | 0.349 | -0.226 |
| pH | | 1 | -0.457 | -0.181 | -0.024 | -0.005 | 0.0131 |
| Acidity | | | 1 | 0,570* | 0.262 | 0.224 | 0.182 |
| Dry Matter | | | | 1 | 0.039 | 0,673* | -0.181 |
| Density | | | | | 1 | -0.364 | 0.001 |
| Fat | | | | | | 1 | -0.261 |
| Lactose | | | | | | | 1 |

* P <0.05

**Table 3**
**Correlation of milk yield and composition during post-estrus**

| | Milk Yield | pH | Acidity | Dry Matter | Density | Fat | Lactose |
|---|---|---|---|---|---|---|---|
| Milk Yield | 1 000 | -0.104 | 0.383 | -0.394 | -0.386 | 0.289 | -0.050 |
| pH | | 1 000 | -0.310 | 0.070 | 0.025 | 0.117 | -0.755* |
| Acidity | | | 1 000 | -0.138 | -0.441 | 0.503* | 0.018 |
| Dry Matter | | | | 1 000 | 0.718* | -0.169 | 0.102 |
| Density | | | | | 1 000 | -0.333 | -0.119 |
| Fat | | | | | | 1 000 | -0.156 |
| Lactose | | | | | | | 1 000 |

* P <0.05

Sekerden et al., 1992; Akcapinar and Ozbeyaz, 1999; Lopez et al., 2004; 2005). The reason for the decreased milk yield during estrus could be the increase in estrogen levels both in milk and blood and this re-

duction might be caused also by a decrease in feed intake. These results are in accordance with previous studies indicating a negative relationship between estrogen concentrations in milk and blood and milk yield (Lopez et al. 2002; 2004; 2005). Walton and King (1986) indicated that the feed intake decreased by % 15 and the magnitude of milk yield reduction is % 7-35 during estrus. Because decreased time spent feeding has resulted in decreased milk yield in cows in estrus (Lopez et al., 2005).

There was no significant difference (P>0.05) in pH, acidity, dry matter, density, fat and milk lactose content between estrus and post estrus period. On the other hand density, acidity and dry matter of milk decreased during post estrus period when compared to estrus period. While mean lactose level during the estrus was 4.75 %, it was 4.65 % during post estrus period. Sekerden et al. (1992) found that lactose rate in evening milked Jersey cows with different lactation numbers decreased at the estrus period but there was no change in the amount of other other milk components. On the other hand other studies indicate that milk fat increased (Erb et al., 1952; King, 1977; Cowan and Larson, 1979) and dry matter in milk has a tendency to decrease (King, 1977) during estrus period.

In Table 2, phenotypic correlation coefficients between pH, acidity, dry matter, fat, lactose and density values of milk in estrus period are presented. In this period, significant phenotypic correlation coefficients (P<0.05), were determined between acidity-dry matter (r = 0.570) and dry matter-fat (r = 0.673). In others words, a positive correlation was determined between acidity and dry matter, and dry matter and fat values of milk in estrus period. Positive correlation between dry matter-fat may be related to the lower milk production during period compared to post estrus period.

In Table 3, phenotypic correlation coefficients between pH, acidity, dry matter, fat, lactose and density values of milk in after estrus period are presented. Significant correlation coefficients are determined between lactose-pH (r = -0.755); dry matter-density (r = 0.718) and acidity-fat (r = 0.503) levels of milk. From these characteristics a high negative relationship between lactose-pH, a positive correlation between dry matter-density and between acidity-fat were determined.

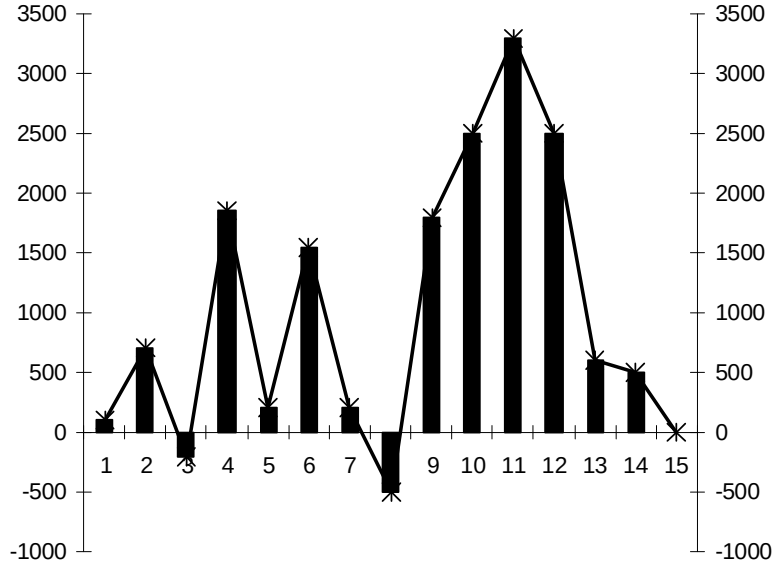


**Fig. 1. Variations of daily individual milk yield in estrus and post-estrus period (g)**

## Conclusions

In this study, the utility of using changes in milk yield and milk content during oestrus in heat detection is investigated. For this purpose, while keeping the factors such as lactation number which is determinate in milk yield and content, lactation period, age of animal, season, feeding and race constant, the changes in milk yield and content have been tried to be determined.

In conclusion, it was found that that estrus has a milk production decreasing effect in Jersey cows. On the other hand, ph, acidity, dry matter, density, fat yield and lactose levels of milk remained unchanged. The results of this study show that the decrease in milk yield during oestrus in Jersey cows can be used in the detection of oestrus.

However, to reach an exact conclusion, similar studies must be performed on bigger populations, in different seasons, years and regions.

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