

EFFECT OF ESTRUS ON SOMATIC CELL COUNT, PROTEIN AND FAT CONTENTS IN MILK OF NILI-RAVI BUFFALOES

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The present study was conducted with the objective to study the effect of oestrus on somatic cells count, fat and protein contents in milk of Nili-Ravi buffaloes. The research was carried out on twenty lactating Nili-Ravi buffaloes during October to November 2007 at Buffalo Research Institute, Pattoki, District Kasur. All buffaloes were in their second lactation and were above sixty days postpartum. Estrus was recorded daily for 8 week in experimental buffaloes. Once weekly, during the morning milking, 100 ml of milk was sampled from all animals for the determination of somatic cell count, protein and fat. There was significant difference ($P < 0.01$) in the somatic cell count during proestrus/ estrus ($383 \pm 39 \times 10^3$ cells/ml) as compared to metestrus ($241 \pm 65 \times 10^3$) and diestrus ($236 \pm 44 \times 10^3$ cells/ml) stages while a non-significant difference was observed between somatic cell count during metestrus and diestrus stage of estrus cycle. Protein contents were significantly higher ($P < 0.01$) during proestrus/ estrus ($3.7 \pm 0.10\%$) compared with metestrus ($3.4 \pm 0.16\%$) and diestrus ($3.4 \pm 0.12\%$) while non-significantly differ between metestrus and diestrus stages of estrus cycle. There was non-significant difference ($P > 0.01$) in fat contents during proestrus/ estrus ($4.8 \pm 0.16\%$), metestrus ($4.7 \pm 0.13\%$) and diestrus ($4.8 \pm 0.18\%$) stages of estrus cycle. It was concluded that somatic cell count and protein percentage in milk of Nili-Ravi buffalo were affected by stage of estrus cycle. The somatic cell count in milk could be used to identify the animals in estrus.

Keywords: Buffalo, estrus, milk, somatic cell count, protein, fat

INTRODUCTION

The dairy industry of Pakistan is mainly composed of cattle and buffaloes containing 95% of total milk production in the country (Allore, 1993). Nili-Ravi buffalo is a dynamic breed under the field conditions of Pakistan and is ranked as the best dairy breed of the world. The annual production of milk is over 38.37 billion liters from 29.55 million cattle and 27.33 million heads of buffaloes (Anonymous, 2006-07). Despite this huge milk production, there is shortage of milk supplies in major urban areas of the country and 15 million US \$ worth of dry milk is being imported ever year (Siddiqui, 1999). Under modern dairying the criteria used for determining whether milk is acceptable for processing or not is the level of somatic cell count (SCC). Somatic cell count increases with intramammary infection in dairy cattle (Harmon, 1994; Lerondelle *et al.*, 1993). Somatic cell count is commonly used as an indirect measure of bacterial infection and milk quality in dairy animals.

The influence of estrus on somatic cell count has been studied in dairy cows, but the results were contradictory. In dairy cows, it was demonstrated that injections of estrogens increase somatic cell count independent of changes in milk yield (Haenlein and Krauss, 1974). Other studies in cows demonstrated no effect of estrus cycle stage on milk somatic cell concentration (Anderson *et al.*, 1983), or on milk yield

and composition i.e. fat, protein, total solids and minerals (Cowan and Larson, 1979).

There is scanty information about the somatic cells count during estrus in Nili-Ravi buffaloes. The present study was therefore undertaken with the objective to study the effect of estrus on somatic cells count, fat and protein contents in milk of Nili-Ravi buffaloes.

MATERIALS AND METHODS

The research was carried out on twenty lactating Nili-Ravi buffaloes during October to November 2007 at Buffalo Research Institute, Pattoki, District Kasur. All buffaloes were in their second lactation and were above sixty days postpartum. These animals were free from brucellosis, tuberculosis and mastitis. All experimental buffaloes were housed in the same shed with free access to open air. Each buffalo was identified by ear tag. The animals received their diet according to lactation stage (concentrate and green fodder) and had free access to drinking water and common salt.

Estrus was recorded daily for 8 week in experimental buffaloes. Stages of estrus cycle were defined taking into consideration the day of detection of estrus (d 0) as follows: proestrus/estrus: d -3 to 0; metestrus: d 2 to 5; and diestrus: d 7 to 15. Milk samples not included in these definitions were excluded for consideration from the analysis. Once weekly, during the morning milking, 100 ml of milk was sampled from all animals for the

determination of somatic cell count, protein and fat. Precautions were taken to obtain a uniform composite milk sample that was free of contaminations. The samples were cooled immediately after collection. Determination of somatic cell count, concentration of milk protein and fat were completed within 36 hrs after collection.

For each milk sample, the somatic cell count was determined by following the technique described by Schalm *et al.* (1971). Milk protein contents were determined according to the method described by Davide (1977) and for milk fat determination the method of Aggrawala and Sharma (1961) was used. The mean (\pm SE) values for somatic cell count, protein and fat in milk of experimental buffaloes were calculated. The data was statistically analyzed by using paired t-test (Steel *et al.*, 2006). The values were considered significant at ($P < 0.01$).

RESULTS AND DISCUSSION

The mean (\pm SD) for somatic cell count is shown in figure 1. The mean somatic cell count during proestrus/estrus were $383 \pm 39 \times 10^3$ cells/ml while during metestrus and diestrus somatic cell count were $241 \pm 65 \times 10^3$ and $236 \pm 44 \times 10^3$ cells/ml, respectively. There was significant difference ($P < 0.01$) in the somatic cell count during proestrus/estrus as compared to metestrus and diestrus stages while a non-significant difference was observed between somatic cell count during metestrus and diestrus stage of estrus cycle.

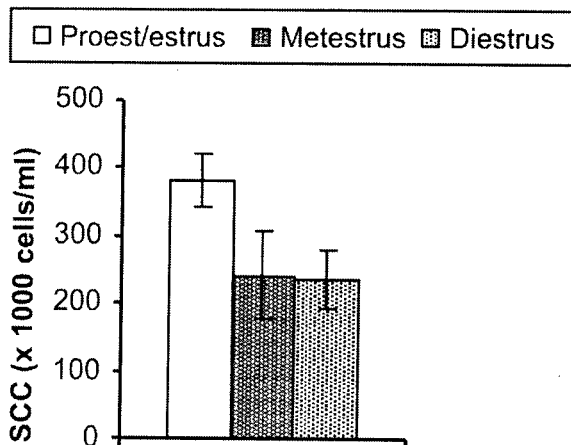


Figure 1. Somatic cell count (SCC $\times 1000$ cell/ml) in milk of Nili-Ravi buffalo during different phases of estrus cycle

The mean (\pm SD) for protein and fat contents are shown in figure 2. The mean protein contents in the milk of Nili-Ravi buffaloes during proestrus/estrus was $3.7 \pm$

0.10% while during metestrus and diestrus protein contents were $3.4 \pm 0.16\%$ and $3.4 \pm 0.12\%$, respectively. Protein contents were significantly higher ($P < 0.01$) during proestrus/estrus compared with metestrus and diestrus while differ non-significantly between metestrus and diestrus stages of estrus cycle. The mean fat contents in the milk during proestrus/estrus was $4.8 \pm 0.16\%$ while during metestrus and diestrus fat contents were $4.7 \pm 0.13\%$ and $4.8 \pm 0.18\%$, respectively. There was non-significant difference ($P > 0.01$) in fat contents during proestrus/estrus, metestrus and diestrus stages of estrus cycle.

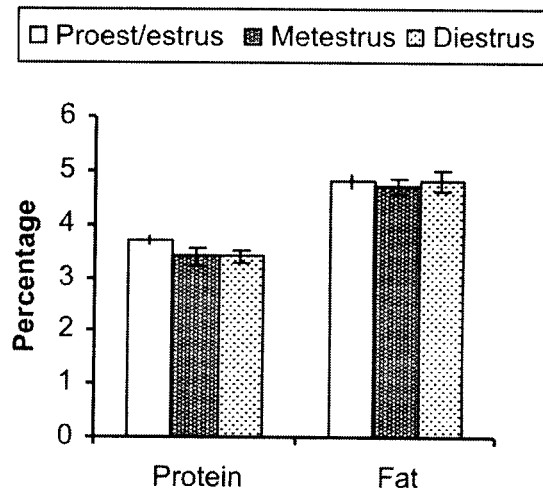


Figure 2. Percentage of protein and fat in milk of Nili-Ravi buffalo during different phases of estrus cycle

In the present study, the mean somatic cell count in milk of Nili-Ravi buffaloes is affected by the day of estrus cycle as differ significantly during proestrus/estrus compared with metestrus and diestrus. The increase of somatic cell count at estrus may be due to the effects of estrogens on the mammary gland. Estrogen action is mediated through interactions with its nuclear receptor (ER), which acts as a transcription factor and regulates gene expression (Clark *et al.*, 1992). Two types of nuclear receptors (ER α and ER β) have been described in ruminants (Kuiper *et al.*, 1997). Cellular responsiveness to estrogens is dependent on nuclear receptor (ER) expression; thus, mechanisms that modify receptor concentration may control the action of estrogen. The ER α increases at estrus reinforcing estradiol action, which characterizes the follicular phase of the estrus cycle (Meikle *et al.*, 2004). Another explanation for increase of somatic cell count at estrus may be due to decrease in milk volume at estrus as milk yield has been reported to declines at estrus in goats (Peaker and Linzell, 1974) and an inverse relationship between milk yield and somatic cell count has been reported in goats (Zeng and Escobar, 1995).

The mean protein contents in milk were significantly higher at proestrus/estrus as compared to other stages of estrus cycle. These findings are in agreement with Moroni *et al.*, 2007. In the present study, the fat contents in milk differ non-significantly among different stages of reproductive cycle. Non-significant difference in fat contents during estrus cycle has also been reported by King, (1977).

Based on the information obtained from this study, it was concluded that somatic cell count and protein percentage in milk of Nili-Ravi buffalo were affected by stage of estrus cycle. The somatic cell count in milk could be used to identify the animals in estrus.

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