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EFFECT OF SEASON, LACTATION AND PARITY ON SOMATIC CELL COUNTS IN CROSS BRED HOLSTEIN FRIESIAN CATTLE

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ABSTRACT
A study was carried out on lactating cross bred Holstein Friesian (HF) cows at Durg, Chhattisgarh to evaluate the effect of season, stage of lactation and parity on somatic cell counts (SCC) of milk. The mean SCC in high and low milk yielders groups were observed as 1.44 ± 0.07 and 1.41 ± 0.07 x10^5 cell/ ml, respectively while in different seasons (winter, summer and rainy) 1.26 ± 0.08, 1.43 ± 0.08 and 1.56 ± 0.09 (x10^5 cell/ ml) were noted as 1.26 ± 0.08, 1.43 ± 0.08 and 1.56 ± 0.09 (x10^5 cell/ ml), respectively. The early, mid and late stage of lactation recorded in these animals were 1.38 ± 0.06, 1.20 ± 0.08 and 1.68 ± 0.08 (x10^5 cell/ ml), while in I, II, III and IV parities were found to be 1.09 ± 0.05, 1.23 ± 0.09, 1.53 ± 0.08 and 1.84 ± 0.07 (x10^5 cell/ ml) respectively. The SCC milk was found highly significant ($p<0.01$) with season, stage of lactation and parity of the cows. Different non genetic factors such as season, parity and lactation stage affect the SCC. This study will help to decide the particular point, where more managemental intervention is required.

INTRODUCTION

In mammals, milk is secretary liquid product of mammary glands. It is important source of nutrient for young animals before they are able to digest other types of food. Somatic cells of milk are white blood cells and epithelial cells, which slough off from the lining of the mammary gland during normal course of milking (Harmon, 1994). They are widely used as marker to determine the mammary health and quality of milk (Dohoo and Meek, 1982 and Eberhart *et al.*,1980) Normally the somatic cells in milk from a healthy mammary gland remains lower than 200,000 cells/ml. SCC between 200 and 299 $\times 10^3$cells/ml may be considered as subclinical mastitis (Tahawy and Far, 2010). However, the number escalates proportionately in response to bacterial infection, tissue injury and stress. There are myriad of factors that alter milk SCC at individual and herd level. In the Chhattisgarh region, genetic and non-genetic factors that influence milk constituents in Holstein Friesian crossbred is scanty (Sarsiha *et al.,* 2004). A number of factors like management, stage of lactation, parity and season amend SCC in milk of cattle, buffalo and goats, but information on mean and variation of SCC during different stage of lactation, parity and season in Holstein Friesian (HF) crossbred cows are very meager. Since the effect of season, parity and lactation stage on SCC pattern is instrumental to deciding the particular point, at which more managemental intervention is required. With this background, it is evident that more in-depth studies of such crucial non-genetic factors is required. Therefore, the present study was aimed to evaluate the effect of non-genetic factors on SCC of milk of HF crossbred dairy cattle.

MATERIALS AND METHODS

Geographical location

The present study was conducted in Holstein Friesian crossbred cows herd maintained at a private dairy Farm located at distance of about10 km from College of Veterinary Science and Animal Husbandry Anjora, Durg (Chhattisgarh). The Durg comes under light tropical, sub-humid and monsoon climatic zone with a seasonal variation in temperature and rain fall. Average temperatures and wind velocity throughout year is 10-45ºC and 9-20 mph, respectively.

Selection of Animals

A total 42 animals were selected for the present study. Lactating animal, that were used for testing milk, were in 1st to 4th order of lactation and in different stages of lactation. The related information such as parity of cows and date of calving were obtained from the records available at the farm.

Feeding and Management

The management of animals at Cattle Cross Bred farm became identical with variation due to reason beyond control. All lactating animals were housed in a well ventilated shed in tail to tail system of housing under identical of feeding and managemental conditions. Cows were hand-milked twice a day after feeding concentrate mixture regularly. The cows were tied and stall-fed individually with required quantities of dry and green fodder. The nutrient requirement of the animals was mostly met through concentrate and *ad libitum* green

fodder. For the maintenance diet, 1.5 kg/day the concentrate ration was fed. Lactating animals were given additional concentrate at rate of 1.0 kg for every 2.5 kg of milk produced above 5.0 kg daily yield to meet their energy requirements. The concentrate mixture was fed in two parts to the cows separately at the time of milking.

Milk sampling

The fresh milk sample was collected separately at morning 5:00 AM and evening 4:30 PM. On each collection day aliquots of morning and evening milking was sampled from each cow in amount proportional to the amount produced followed by mixed thoroughly. The mixed sample was analysed for SCC. The first sample was collected on the 5th day after calving in freshly calved cows and sampling repeated successively at 10 days interval. Total 150 samples were analysed during the period of 8 months (January to August, 2014). A representative sample of milk (20-25ml) was taken. All the animals were the apparently healthy without any sign of disease or ill health.

Determination of Somatic Cell Counts (x10^5 cells / ml)

A total of 150 milk samples were collected from HF cattle with apparently healthy udders producing normal milk in appearance. During each season 50 milk samples of early, mid and late lactation were considered for determination of SCC, taking due care of parity (I to IV). All the animals were divided into two milk production categories considering the herd average milk yield production. SCC in milk samples were done as per method described by Shalm *et al*. (1971). In SCC analysis, direct microscopic counting method (Packard *et al.*, 1992) was performed for sampling. Number of somatic cells was multiplied by the multiplication factor of the microscope to obtain the number of cells per ml of milk.

Classification of Data

Data of animals were classified according to the milk yield (high milk yielders more than 2300kg and low milk yielders less than 1800kg milk production), season (winter, summer and rainy), stage of lactation (early stage, mid stage and late stage) and parity (I, II, III and IV).

Statistical analysis

SPSS 17 software was used for analysis and descriptive statically calculation of raw data. Paired t-test was used for analysis of data (season and lactation stage) and repeated measure analysis of variance. Independent t-test used for the variables that didn't require multistage sampling (parity) for comparison. Individual mean comparisons were made for the significant effect using the formula given by Snedecor and Cochran (1994). Statistical analysis of data was made using least-squares analysis of variance to study the effect of season, parity and stage of lactation on SCC. The following fixed effect model was used for the analysis.

$$Y_{38i} = \mu + A_i + B_j + C_k + å_{38i}$$

Where,

Y_{38i} = l th observation under ithseason jthstage of lactation and kthparity,

μ = Overall mean,

A_i = Effect of ithseason, where i varies from 1 to 3,

B_j = Effect of jth stage of lactation, where j varies from 1 to 3,

C_k = Effect of kth parity, where k varies from 1 to 4

And $å_{38i}$ = Random error, NID $_{(0,y²å).}$

RESULTS

Means (±SE) SCC (x10^5 cell/ ml) for productivity, season, stage and parity wise have been presented in Table1. The mean SCC changes during different seasons were significant ($p<0.01$), being high during rainy season (1.56±.09 x10^5 cell/ ml) and low in winter season (1.26 ±0.07x10^5 cell/ ml). The mean SCC values in case of high and low producers were 1.43±.06 x10^5 cell/ ml and 1.40 ±.07 x10^5 cell/ ml, respectively. After evaluating the effect of milk production on SCC, no significant difference was registered between SCC and milk production. The mean SCC values were low in mid stage of lactation (1.20±0.08 x10^5 cell/ ml), that enhanced to high value during late stage of lactation (1.68±0.08 x10^5 cell/ ml). Analysis of milk yield showed a high significant difference for fixed effect of stage of lactation ($p < 0.01$) and also for lactation order ($p < 0.01$). The mean SCC in 1st parity was lower (1.09±0.05 x10^6 cell/ ml) compared all other parities. The perusal of data showed that SCC was increased with increasing number of lactation. SCC was observed to be lowest in 1st lactation of HF crossbred cows that increased gradually and highest levels were observed in 4th lactation. The analysis showed that the effect of parity on SCC was significant ($P<0.01$). Our study also revealed that the mean SCC of 1st and 2nd parity were significantly ($P<0.01$) lower than all other parities. 1st and 2nd parity did not differ to each other. A significant difference ($p<0.01$) was also reported between mean SCC of 2nd 3rd and 4th parity.

DISCUSSION

During the eight months of experimental period, a total 150 milk samples were examined for Somatic cell count of individual cow. The means of the high and low producing animals was not significantly differed from each other. Similar to present findings, no significant differences in milk SCC were observed by Syridion *et al*. (2012) between different levels of milk yield. Cinar *et al.,* 2015 reported that that SCC had a high significant effect on milk yield. The seasonal variation of SCC is in agreement with other studies (Saravanan *et al*., 2014: Syridion *et al.,* 2012; Tancin, 2013). Lower SCC in summer compared to winter was observed by Yoon *et al*. (2004). Marija *et al*. (2003) noted that Influence of Season was found highly significant on the somatic cell counts of milk. The higher SCC in rainy season in comparison to other season may be due hot and humid environmental conditions during the summer and rainy season as the result of which animals are under stress as well as this condition is suitable for infection of animal. Mean SCC was recorded highest for late stage and lowest counts at mid stage. Similar trends as in present study were found by Syridion *et al*. (2012) and Tancin (2013). Weglarz *et al*. (2008) reported highest SCC value during early stage of lactation In their studies. Tancin (2013) reported significant effect of stage of lactation on SCC of milk. Non-significant changes in SCC during different stages of lactation were

Table 1: Productivity, season, stage and parity wise means (±SE) for SCC (x10^5 cell/ ml)

Non genetic factor	SCC (×10^5/ml) Mean ± SE	
Milk yield	High	1.44±0.07
	Low	1.41±0.07
Season	Winter	1.26^{**}±0.08^a
	Summer	1.43^{**}±0.08^b
	Rainy	1.56^{**}±0.09^b
Stage of lactation	Early	1.38^{**}±0.06^b
	Mid	1.20^{**}±0.08^a
	Late	1.68^{**}±0.08^c
Parity	I	1.09^{**}±0.05^a
	II	1.23^{**}±0.09^a
	III	1.53^{**}±0.08^b
	IV	1.84^{**}±0.07^c

** = significant (P<0.01), ns = non significant and mean superscripted (a, b, c and d) differed significantly (P <0.01) from each other.

reported by Saravanan *et al*. (2015). In present study higher values of SCC in early stage of lactation might be due the post partum stress and negative energy balance during very early stage. The SCC increased towards the end of lactation, because of higher infection rate, as the teat streak canals are dilated due to continuous milking. Normal involution of udder during the later stage and decreased milk production, which causes less dilution of the milk SCC, may be the possible reason for higher SCC during later stage of lactation. Milk samples obtained from the cows belonging to 4th parity had higher SCC values compared to other parity groups (Syridion *et al.,* 2012). Means SCC of 2nd 3rd and 4th parity were significantly (p<0.01) differed from each other. Similar observations were reported by Tancin (2013). The higher SCC in later parity in comparison to primiparous animals may be due to the fact that animal's resistance to mastitis might be lowered with advancement of lactation number or age.

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