



Research Article

EFFECT OF MILKING FREQUENCY ON PRODUCTION PERFORMANCE AND PLASMA HORMONES LEVEL IN SAHIWAL COWS

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Abstract- The experiment was carried out on 88 lactating healthy Sahiwal cows. All the animals were maintained under loose housing system and machine milked during morning, noon and evening time. Milking attributes like milk let-down time, milking time and milking rate were determined in each season. Plasma cortisol level, IGF-1 and IgG of all the animals were estimated. The aliquots of milk samples from individual animal were composited and fat, protein, lactose, SNF and total solids were measured. Somatic cells present in the pooled milk samples from individual animals were estimated. The low yielder cows were milked twice daily and the high yielder cows were milked thrice daily. Milk flow rate ($P < 0.05$) and Milk yield ($P < 0.01$) were significantly higher in three times of milking as compared to two times of milking. Fat, TS and lactose % were significantly ($P < 0.01$) higher in two times of milking as compared to three times of milking but SNF ($P < 0.01$) and Protein ($P < 0.05$) were significantly higher in three times of milking as compared to two times of milking. Milk let-down time, Milking time and Total milking time were numerically lower in two times of milking as compared to three times of milking. Somatic cell counts ($\times 10^3$ cell/ml) were also lower in two times of milking as compared to three times of milking. The Cortisol level was significantly ($P < 0.001$) lower in two times as compared to three times of milking. Plasma concentration of IgG was also significantly lower ($P < 0.01$) in two times as compared to three times of milking. The plasma level of IGF-1 was non-significantly variable but it was numerically lower ($P > 0.05$) in three times as compared to two times of milking's. So it can be concluded that milking frequency had significant impact on milk flow rate, milk yield, fat, Total solids, lactose, SNF and Protein. Plasma hormones like cortisol and IgG also varied significantly between two and three times of milking.

Keywords- Sahiwal, Milking Frequency, Milking Attributes, Milk Yield, Composition, Cortisol, IgG, IGF-1

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Introduction

Different variations in milking frequency or different lengths of inter milking intervals have been tried over the last few decades. Usually these have been for social, production management, or economic reasons. As milk production per cow and herd averages have increased, the interest in milking frequency and interval by dairy farm management has also increased. Practices which were considered to be common in the early part of the century, such as once a day milking, twice a day with intervals of 9-14 hours between milking, and even skip-a-milking a day, would not be considered as acceptable in present milking management of high producing cows. A review of past milking practices may help understand what and why about the practices of milking management used today. Dairying is one of the major instruments for improving socio-economic condition of rural people in India [14]. The milking management is one of the most important management of dairy farm on its production efficiency and profitability [15]. Three times milking increase milk yield in both hot-humid and winter season in Sahiwal cows milked three times in a day [18]. The higher milk yield in cows milked three times per day might be due to the fact that milk secretion is a continuous process resulting in gradual elevation of internal udder pressure [17]. Insulin-like growth factor 1 (IGF1) is the major metabolic hormone that is reduced in lactating cows, potentially because of changes in liver function during early lactation [8]. The level of plasma cortisol is typically used as a physiological indicator for comparing several new management systems [1]. Cortisol stimulates protein catabolism in muscle and gluconeogenesis

and milk cortisol concentration is negatively correlated with milk protein and SNF content [3]. A number of studies have been carried out in exotic cows and buffaloes revealing that milking frequency influence different milking attributes and other production performance of animals. Though considerable information is available in exotic cows and buffaloes however in Sahiwal the information is limited [11] and the effects of milking frequency in relation to SCC have not been studied [4]. Keeping in view, the present study is designed with the objective of effect of milking frequency on milk let-down time, milking time, milking rate, milk composition, milk yield and somatic cell counts in association with hormones (Cortisol and IgG) and immunoglobulin level in Sahiwal cows.

Materials and Methods

The plan of experiment was duly approved by the Institutional Animal Ethical Committee. The experiment was carried out on 88 lactating healthy Sahiwal cows. Parity was on an average 3 and stage of lactation ranged from 113.45 ± 8.52 to 125.17 ± 6.20 . The cows were managed in loose housing system and were fed as per the feeding practices of the herd. All the experimental animals were subjected to machine milking during morning, noon and evening time. The low yielder cows (4.88 ± 0.63 to 5.94 ± 0.72 kg) were milked twice daily in the morning (6:00 am) and evening (6:00 pm) and the high yielder cows (8.43 ± 0.59 to 10.68 ± 0.72 kg) were milked thrice daily in the morning (6:00 AM), noon (12:00 PM) and evening (6:00 PM). Parameters like milk let down time, milking time, milk yield and body

condition score was recorded by a stop watch at the time of milking in the parlour. Milk samples were collected and milk composition fat, protein, lactose, SNF and total solids were measured using Milkoscan. For testing the SCC of each animal the Ekomilk scan (somatic cell analyzer) was used. Body condition score was also recorded. Plasma cortisol, IGF-1 and total immunoglobulin (IgG) were estimated by Enzyme-linked Immunosorbent Assay Kit.

The statistical analysis of the data was carried out using 2-way analysis of variance (least squares analysis). The mean and standard error were calculated and critical difference (CD) at 5 percent level was also found out for significant difference.

All data obtained in the study were subjected to the statistical analysis as per procedure described by the Snedecor and Cochran (1994). The significance of the differences between the mean values of various parameters studied was tested by employing SPSS 20.0 version computer software.

Results and Discussion

Milk let-down time in two and three times of milking were 31.68 ± 2.29 vs. 34.15 ± 1.69 seconds. Milk let-down time was numerically lower in two times of milking as compared to three times of milking but it was non-significant [Table-1]. Milking time in two and three times of milking was 5.16 ± 0.20 and 5.23 ± 0.16 min. Milking time was numerically lower in two times of milking as compared to three times of milking but it was non-significant [Table-1].

Total milking time in two and three times of milking were 5.49 ± 0.20 and 5.59 ± 0.16 min. Total milking time was numerically lower in two times of milking as compared to three times of milking but it was non-significant [Table-1] [Fig-1].

Milk flow rate in two and three times of milking were 0.47 ± 0.026 and 0.59 ± 0.02 kg/min. Milk flow rate was significantly ($P < 0.05$) lower in two times of milking as compared to three times of milking [Table-1] [Fig-1].

Milk yield in two and three times of milking was $8.07^A \pm 0.18$ and $10.23^B \pm 0.13$ kg. Milk yield was significantly ($P < 0.01$) lower in two times of milking as compared to three times of milking [Table-1]. Similarly to the finding [2] optimum production performance in 24 lactating sahiwal cows in their 3rd to 4th parity in which the milk yield (kg) observed in machine milking twice and thrice were 9.25 ± 0.21 and 11.75 ± 0.28 respectively. Average daily milk yield was significantly higher ($p < 0.05$) in 3 times milking as compared to 2 times milking. The lower ($P < 0.01$) milk yield in two times milking as compared to three times of milking was due to less secretion of milk.

In Sahiwal cow's fat percentage in two and three times of milking were 4.79 ± 0.07 vs. 4.07 ± 0.05 , SNF percentage were 9.38 ± 0.05 vs. 9.74 ± 0.03 , TS percentage were 14.17 ± 0.07 vs. 13.82 ± 0.06 and lactose percentage were 4.63 ± 0.02 vs. 4.24 ± 0.04 , respectively. Fat, TS and lactose % were significantly ($P < 0.01$) higher in two times of milking as compared to three times of milking but SNF was significantly ($P < 0.01$) lower in two times of milking as compared to three times of milking. Protein content in two and three times of milking were 2.99 ± 0.04 and 3.09 ± 0.02 %. Protein content was significantly ($P < 0.05$) lower in two times of milking as compared to three times of milking [Table-1]. Similar changes also reported by [6]; [10] and [9]. According to [12] and [2] the Fat %, TS % and lactose % were significantly ($P < 0.01$) higher in two times milking as compared to three times milking. They also reported that protein content was significantly ($P < 0.05$) lower in two times milking as compared to three times milking. The high percentage of total solids in milk from cows milked twice daily might be due to a high fat percentage. The negative effect of frequent milking on fat content can be attributed to increased air exposure due to frequent milking, enzymatic activity of fatty acid synthetase and increased production of short-chain fatty acids [7].

Somatic cell counts ($\times 10^3$) were 168.22 ± 3.37 vs. 170.80 ± 3.52 and BCS were 3.80 ± 0.03 vs. 3.72 ± 0.03 in two times and three times milking's respectively [Table-1]. With conformity [13] reported that SCC in 2 times milking and 3 times milking herds throughout the 5-days sampling period, no consistent diurnal variation was present but [16] reported that elevated somatic cell counts were associated with high fat and protein content and with lower lactose content in milk. The effect of milking frequency on Cortisol level was highly significant ($P < 0.001$) and it was lower in two times as compared to three times of milking. Cortisol (plasma conc. ng/ml) was 10.37 ± 0.67 vs.

13.57 ± 0.33 in two times and three times of milking respectively. IGF-1 (plasma conc. ng/ml) was 130.63 ± 8.48 vs. 113.35 ± 7.20 in two times and three times of milking respectively. The difference in the plasma level of IGF-1 was non-significant between two and three times of milking and it was numerically lower ($P > 0.05$) in three times as compared to two times of milking's. Plasma concentration of IgG was also significantly lower ($P < 0.01$) in two times as compared to three times of milking. IgG plasma conc. (micro gram/ml) was 33.25 ± 1.64 vs. 40.52 ± 1.71 in two times and three times of milking respectively [Fig-1]. Cortisol stimulates protein catabolism in muscle and gluconeogenesis and milk cortisol concentration is negatively correlated with milk protein and SNF content [3]. According to [5] an increase of plasma cortisol in cows with milk fever, associated with immune suppression and increase risk of clinical mastitis and high somatic cell count in milk. [20] reported that the cortisol concentration is a useful indicator of acute stress also plasma cortisol levels of HF calves declined by heat exposure. The IGF-I is involved in somatic growth acting as the mediator of Growth Hormone dependent building of body mass [19].

Conclusion

Milking frequency significantly influences milk flow rate, milk yield, fat, total solids, lactose, SNF and Protein but it did not influence milk let down time, milking time, total milking time and SCC. The effect of milking frequency on Cortisol level was highly significant and IgG also varied significantly between the groups but the difference in the plasma level of IGF-1 was non significant between two and three times of milking.

Table-1 Effect of 2 times and 3 times milking on different milking parameters in Sahiwal Cows.

Parameters	Two times of milking	Three times of milking
Milk let-down time (seconds)	31.68 ± 2.29	34.15 ± 1.69
Milking time (Min.)	5.16 ± 0.204	5.23 ± 0.16
Total milking time (Min.)	5.49 ± 0.201	5.59 ± 0.16
Milk flow rate (kg/min.)	$0.47^A \pm 0.026$	$0.59^B \pm 0.02$
Body condition score	3.80 ± 0.03	3.72 ± 0.03
Milk yield (kg)	$8.07^A \pm 0.18$	$10.23^B \pm 0.125$
Milk composition (%)		
Fat	$4.79^A \pm 0.07$	$4.07^B \pm 0.05$
SNF	$9.38^A \pm 0.05$	$9.74^B \pm 0.03$
TS	$14.17^A \pm 0.07$	$13.82^B \pm 0.06$
Protein	$2.99^A \pm 0.04$	$3.09^B \pm 0.02$
Lactose	$4.63^A \pm 0.02$	$4.24^B \pm 0.04$
Somatic cell counts ($\times 10^3$)	168.22 ± 3.37	170.80 ± 3.52

Superscripts A, B in a row differ ($P < 0.05$)

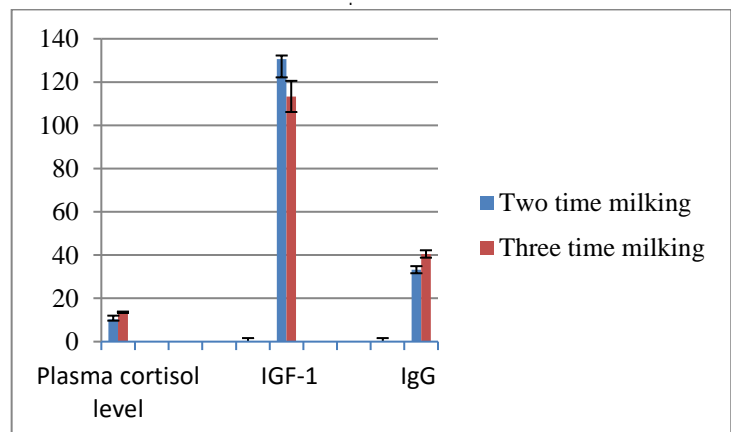


Fig-1 Effect of 2 times and 3 times milking on different plasma hormones level in Sahiwal Cows.

Conflict of Interest: None declared

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