

Original Research Article

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## Milking Temperament Influence on Production Performance and Plasma Hormones in Sahiwal Cows

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### ABSTRACT

Present study was conducted to explore the effect of milking temperament on milking attributes like milk let down time, milking time, milk flow rate, milk yield, composition in relation to plasma cortisol level and reproductive performance in Sahiwal cows. The experiment was carried out on 88 lactating healthy Sahiwal cows in hot-humid (38) and winter (58) season. The milking temperament was scored and the cows were grouped as docile and restless. Milking attributes like milk let down time, milking time and milking rate was determined in each season. Plasma cortisol was estimated and the reproductive performance of all the animals was recorded. Milking temperament did not influence milk let down time, milking time, total milking time, milk flow rate and milk yield in both the seasons of experiment however, fat ( $P<0.01$ ) and total solids ( $P<0.05$ ) were higher in restless animals as compared to docile in hot-humid season. Mean body condition score (BCS) was non-significant between the group ( $p>0.05$ ) in both the seasons. Mean milk SCC was lower ( $P<0.01$ ) in docile as compared to restless animals in hot-humid season, but did not vary in winter season. Plasma cortisol level was significantly lower ( $P<0.01$ ) and IGF-I, IgG was lower ( $P<0.01$ ) in docile animals than the restless in both the seasons. Docile cows exhibited first post-partum heat earlier ( $P<0.05$ ) and had less service period ( $P<0.01$ ) than the restless. It was concluded that temperament at milking influences milk fat %, total solids and SCC of milk. Restless temperament of Sahiwal cows at milking lead to elevated plasma cortisol and lower IGF-I hormone level in Sahiwal cows which are associated with milk production.

#### Keywords

Temperament,  
Sahiwal, Docile,  
Restless, Milking

#### Article Info

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### Introduction

The temperament of animals is generally considered innate and it is determined by animal's physical and nervous organization, and is affected by external factors also (Prasad and Laxmi, 2014). Proper handling and management are important for temperament

and higher milk yield (Rasmussen and Reinemann, 2010). Good temperament is often equated with or used to describe calm behavior of the animal while poor temperament describes an animal that appears more disturbed and agitated (Herve *et al.*, 2007). It has been found that nervous type animals require longer let-down time in

Murrah buffaloes and Karan Fries cows, respectively (Roy and Nagpaul, 1984). Aggressive buffaloes take maximum time in total milking and in let down time mainly due to difficulty in handling at milking (Gupta *et al.*, 1985). Aggressive cows also require more time because worker spent maximum time for milking due to more let down time and difficulty in handling of animals at milking (Chauhan *et al.*, 2013). Contrary to this cows with docile temperament took minimum let-down time. A number of studies in exotic cows and buffaloes reveal crucial role of temperament at milking in getting the good yield and quality milk. At the same time it adversely affects milk let down time and in turns milking management of animals. Though considerable information is available in exotic cows and buffaloes however in Indigenous heat tolerant Sahiwal cows the information is very scanty (Pathak, 2002). Also very few studies have been focused on the association between production traits and milking temperament. Keeping in view, the present study was designed to find out the effect of milking temperament on different milking attributes and reproductive performance in association with hormones and immunoglobulin levels in lactating Sahiwal cows.

## **Materials and Methods**

The experiment was conducted on 38 lactating healthy Sahiwal cows in hot humid and 50 cows during winter season. The cows were grouped as docile and restless on the basis of milking temperament at the time of milking. These were managed in loose housing system and were fed as per the feeding management practices of institute herd. The Sahiwal cows were machine milked thrice a day at 5am, 12noon and 6pm and the yields were recorded. The experiment was carried out during the summer (Hot-humid) and winter (Dec. – Jan.) seasons. During hot-humid season humidity

was more than 85% and temperature ranged from 36°C - 37°C than the winter season temperature of 13°C-15°C (min.) and 20-24°C (max.). Milk samples were collected at each milking and aliquots of milk samples from individual animal were composited in proportion to their milk yield. Milk fat, protein, lactose, SNF and total solids were measured using Milkoscan. The observations on let down time, milking time, total milking time was recorded by a digital stop watch. Milking temperament was recorded for two consecutive days at each milking. Body condition score was also recorded as described by Balakrishnan *et al.*, (1997) in each season. Milk SCC was determined by somatic cell analyzer (Ekomilk scan). Plasma cortisol, IGF-1 and total immunoglobulin (IgG) levels were estimated by Enzyme-linked Immunosorbent Assay Kit (Bioassay Technology Laboratory). The statistical analysis of the data was carried out by 2-way least square analysis (SPSS 20.0 computer software) and the mean and standard errors were calculated. The significance of the differences between the means of various parameters was tested for significance. The plan of experiment was duly approved by the Institutional Animal Ethical Committee.

## **Results and Discussion**

The percent incidences of docile and restless Sahiwal cows were higher in summer (68.95 vs. 31.05%) than the winter season (60.57 vs. 39.43%). The behaviour of Sahiwal cows did not influenced milking attributes like milk let down time, milking time and total milking time significantly though values were numerically lower in docile as compared to restless cows (Table 1). The lower milking time and total milking time observed in docile cows was due to docile and easy milking behavior of cows and is in agreement with the report of Roy and Nagpaul (1984). Further aggressive animals required the maximum

time in total milking due to more let down time and difficulty in handling of animals at the time of milking (Gupta *et al.*, 1985). This was the reason that milk flow rate and milk yields were higher in docile as compared to restless cows in both the seasons. Milk flow rate was non-significantly higher in docile as compared to restless Sahiwal cows. Studies in buffaloes also reveal that docile buffaloes produce more milk ( $P<0.05$ )/milking with highest average milk flow rate in the shortest possible time (Gupta *et al.*, 1985). However buffaloes having a temperament score of five (more temperament) were poor yielders and those with a score of one and two (good temperament) were good milk yielders and had higher daily milk yield (Prasad *et al.*, 2011). Several reports also indicated similar observations on higher milk yield in docile animals than the aggressive (Prasad and Laxmi, 2014). The observed high milk flow rate in docile cows than the restless ones was attributed to maximum time in milking operation in order of aggressive followed by nervous, restless and minimum time recorded in docile cows (Chauhan *et al.*, 2013). The minimum let-down time in cows with docile temperament further indicate that cows

comfortable behaviour at milking possess full milking potential while Sahiwal cows with aggressive temperament took more letdown time indicating that restless nature is not good for a milking animal. Milk fat % ranged between 2.8 to 6.2 in docile vs. 3.2 to 6.8 in restless cows during summer and 2.13 to 6.2 % in docile vs. 2.3 to 5.8% in restless during winter season. Total solids was non-significant in docile and restless cows and ranged between 12.46 to 15.4 vs. 10.52 to 16.27 in summer and 10.86 to 15.52 vs. 11.86 to 15.52 in winter seasons, respectively (Table 2). Protein and lactose content of milk was not influenced by temperament. Milk fat ( $P<0.01$ ) and TS ( $P<0.05$ ) percentage was more in restless as compared to docile cows in hot-humid season. Protein (%) was higher ( $P<0.05$ ) in restless animals as compared to docile in winter season (Table 2). The BCS of docile and restless cows did not vary and ranged between 2.4 to 3.9 vs. 3.0 to 4.0 in hot-humid and from 3.0 to 4.0 vs. 3.0 to 4.0 during winter season, respectively (Table 3). Milk SCC was more in restless than the docile cows and was 88 to 312 vs. 110 to 332x10<sup>3</sup> cells/ml in hot-humid and 67 to 287 vs. 67 to 288 ×10<sup>3</sup> cells/ml in winter (Table 3).

**Table.1** Effect of temperament on different milking parameters in Sahiwal cows milked thrice a day in two different seasons

Temperament score	Hot-humid season	Winter season
Milk let-down time (seconds)		
Docile	18.87±0.94 <sup>a</sup>	33.68±1.88 <sup>a</sup>
Restless	19.95±3.82 <sup>a</sup>	39.71±2.86 <sup>b</sup>
Milking time (Min.)		
Docile	6.18±0.14	5.17± 0.20
Restless	6.53±0.61	5.23± 0.25
Total milking time (Min.)		
Docile	6.47±0.15	5.520±0.20
Restless	7.18±0.63	6.176±0.26
Milk flow rate (kg/min.)		
Docile	0.46±0.02	0.61± 0.03
Restless	0.41±0.06	0.55±0.03

**Table:2** Effect of temperament on milk yield and milk composition of Sahiwal cows milked thrice a day in two different seasons

Temperament score	Hot-humid season	Winter season
<b>Milk yield (kg)</b>		
Docile	8.43± 0.59 <sup>a</sup>	10.68 ±0.72 <sup>a</sup>
Restless	7.54±0.93 <sup>a</sup>	9.18±0.61 <sup>a</sup>
<b>Milk Composition</b>		
<b>Fat (%)</b>		
Docile	4.44 <sup>A</sup> ±0.04	4.19±0.08
Restless	4.84 <sup>B</sup> ±0.19	4.03±0.07
<b>SNF (%)</b>		
Docile	9.44±0.03	9.77±0.05
Restless	9.44±0.09	9.83±0.05
<b>TS (%)</b>		
Docile	13.87 <sup>A</sup> ±0.04	13.98 ±0.08
Restless	14.19 <sup>B</sup> ±0.25	13.86±0.09
<b>Protein (%)</b>		
Docile	3.16±0.02	3.05 <sup>A</sup> ±0.03
Restless	3.12±0.04	3.12 <sup>B</sup> ±0.02
<b>Lactose (%)</b>		
Docile	4.74±0.20	4.71±0.03
Restless	4.53±0.05	4.72±0.03

Values with different superscripts A, B differs (P<0.05) in a column significantly

**Table.3** Effect of temperament on somatic cell count and body condition score in Sahiwal cows milked thrice a day in two different seasons

Temperament score	Hot-humid season	Winter season
<b>Somatic cell counts (× 10<sup>3</sup>)</b>		
Docile	159.98 <sup>A</sup> ±3.06 <sup>a</sup>	144.25±5.07 <sup>a</sup>
Restless	192.54 <sup>B</sup> ±12.78 <sup>b</sup>	145.16±4.88 <sup>a</sup>
<b>Body condition score</b>		
Docile	3.57±0.03 <sup>a</sup>	3.72±0.03 <sup>a</sup>
Restless	3.48±0.04 <sup>a</sup>	3.68±0.03 <sup>a</sup>

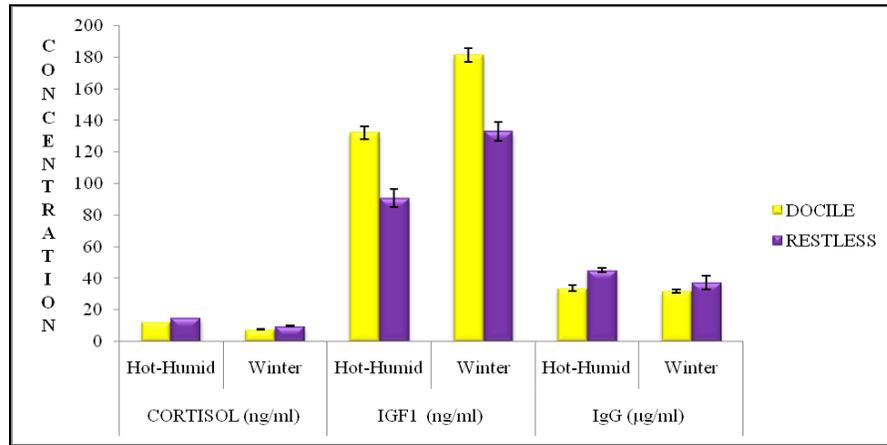
Values with different superscripts a, b differs (P<0.05) in a column

**Table.4** Effect of temperament on reproductive performance in Sahiwal cows milked thrice a day in two different seasons

Temperament score	Hot-humid season	Winter season
<b>First observed post-partum heat (days)</b>		
Docile	70.70 <sup>a</sup> ±4.74	64.31 <sup>a</sup> ± 3.01
Restless	85.61 <sup>b</sup> ± 4.57	79.07 <sup>b</sup> ± 3.43
<b>Service period (days)</b>		
Docile	101.25 <sup>a</sup> ± 4.04	94.56 <sup>a</sup> ±3.30
Restless	141.72 <sup>b</sup> ± 4.67	121.53 <sup>b</sup> ±3.84
<b>No. of Service per conception</b>		
Docile	1.45 <sup>a</sup> ± 0.135	1.31 ± 0.12 <sup>a</sup>
Restless	1.89 <sup>b</sup> ± 0.16	1.67 ± 0.16 <sup>b</sup>

Values with different superscripts a, b differs (P<0.05) in a column

**Fig.1** Effect of milking temperament on plasma hormones during different season in lactating Sahiwal cows



The significantly lower ( $P=0.01$ ) SCC in calmer cows as compared to temperamental ones has been reported by Orban *et al.*, (2011). Thus calmer cows with low SCC produced more hygienic milk than temperamental animals (Gergovska *et al.*, 2014). Plasma cortisol level was less in docile ( $12.37 \pm 0.20$  ng/ml) than the restless cows ( $15.03 \pm 0.19$  ng/ml) in hot-humid and winter season ( $7.67 \pm 0.08$  vs.  $9.77 \pm 0.14$  ng/ml; Fig. 1).

The significantly lower cortisol level in winter season was due to the low ambient temperature as high temperature increase plasma cortisol levels (Pajor *et al.*, 2010; Curley *et al.*, 2006 and King *et al.*, 2006). The temperamental cattle display an endophenotype of chronic stress due to which cortisol concentrations are elevated as in depression (Curley *et al.*, 2008, 2010). Plasma IGF-1 level was higher in docile ( $132.38 \pm 4.17$  ng/ml) than the restless cows ( $90.76 \pm 5.68$  ng/ml) in hot-humid season and winter season ( $181.52 \pm 4.17$  vs.  $133.17 \pm 6.00$  ng/ml) and suggested a galactopoietics effect on milk yield. The higher IGF-I level could be attributed to better production and reproduction performance in docile animals. IGF-1 is also recognized as a signal that controls reproductive function, the IGF-1

system and its interaction with the reproductive axis may account for increased reproductive efficiency. Cows with better reproductive performance have been found to have higher concentrations of circulating IGF-1 (Meikle *et al.*, 2004).

The IgG levels were lower in docile than the restless cows ( $33.84 \pm 1.83$  vs.  $45.12 \pm 1.30$  µg/ml) in hot-humid and winter season ( $31.88 \pm 0.91$  vs.  $37.45 \pm 4.21$  µg/ml) (Fig. 1). The higher IgG level ( $P < 0.01$ ) in restless animals could probably due to restless behavior and indicated more susceptible to infections. Though temperamental steers have lower *in-vitro* lymphocyte proliferation and lower *in-vivo* IgG concentrations as compared to calm steers (Oliphint, 2006).

The onset of first observed post-partum heat was earlier in docile (24 to 107 days) than the restless cows (56 to 136 days) in hot-humid and in winter season (45 to 87 Vs. 58 to 106 days). The service period was higher in restless (117 to 200 days) than the docile cows (60 to 129 days) during hot-humid and winter season (75 to 115 vs. 96 to 144 days). Average number of services/conception was less in docile than the restless animals (Table 4) in hot humid (1 to 3 vs. 1 to 3) and winter season (1 to 2 vs. 1 to 3). The better

reproductive performance of docile cows in both the seasons was indicative of adverse effects of excitable behavior of cows leading to poor reproductive performance than docile (calmer) cows by influencing hormone of reproduction (Kasimanickam *et al.*, 2014 and Rueda *et al.*, 2015).

In conclusion, indigenous Sahiwal cows having docile behavior at milking exhibit higher milk production performance than the aggressive Sahiwal cows. Restless temperament at milking results in more time in milking operations. Such cows have higher milk SCC and plasma cortisol and lower IGF<sub>1</sub> levels resulting in poor reproductive performance than the docile cows.

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