RESEARCH ARTICLE

Effect of Milking Temperament on Milkability Traits and Milk Composition in Gir Cows

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Abstract

The present research work was conducted on Gir cows (n=50) to study the association of temperament with milkability traits and milk composition. The temperament of Gir cows was assessed fortnightly using 4 point scale scoring system (1= docile, 2 = restless, 3 = nervous, 4 = aggressive). The milkability traits like milk let down time, milking time, milk yield and milk flow rate were recorded at fortnightly interval. Similarly, milk components like fat, solid not fat (SNF), protein, lactose and total solid (%) were estimated at fortnightly. The milk let down and milking time were significantly ($p \leq 0.05$) lower, while milk yield per milking and milk flow rate were significantly ($p \leq 0.05$) higher in docile cows as compared to restless, nervous and aggressive cows. All the milk constituents (fat, SNF, lactose, protein and total solid) were significantly ($p \leq 0.05$) higher in docile cows compared to other cows. Thus, it is concluded that Gir cows with docile temperament have better milkability, milk yield and milk quality.

Keywords: Gir cows, Milkability, Milk composition, Temperament.

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Introduction

Temperament in animals reflects their reaction to the surrounding conditions (Herve *et al*., 2007). In dairy bovines, temperament particularly at milking is most important because it not only affects efficiency of milking process but also residual milk (Haskell *et al*., 2014). It has been reported that temperament of animal at milking affects the milkability traits like milk letdown time, milking time, milk flow rate as well as milk yield and milk composition of taurine (Haskell *et al*., 2014; Abdel-Hamid *et al*., 2017) and zebu cattle (Chauhan *et al*., 2013; Shehar *et al*., 2015; Tamboli *et al*., 2018). The cows with calm temperament have better yield and milking speed, hence selected by the farmers for herd survivability, while the non-docile or aggressive cows are being culled (Haskell *et al*., 2014). Assessment of temperament is easy and non-invasive, so it could be used as a tool for improving individual as well as herd productivity in dairy cows (Antanaitis *et al*., 2021).

The heritability of milking temperament in dairy cattle is low to moderate (Haskell *et al*., 2014), which reflects that it has importance in selection process and regulated by genetic make-up of the animals. The low heritability also indicates that surrounding environmental factors are key stimulants that influence milking temperament. Stress is the main reason associated with changes of temperament of cow before milking, which converts the animal from docile to aggressive state. Although studies have been conducted on association of temperament on milkability traits and milk composition in dairy cattle, the information on Gir cows is scanty. Hence, this study was designed to find out the effect of milking temperament on milkability traits and milk composition in Gir cows.

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Materials And Methods

The study was carried out on 50 healthy lactating Gir cows having similar production performance maintained at Cattle Breeding Farm of Agricultural University, Junagadh from February 2022 to May, 2022. Gir cows were maintained under loose housing system and fed as per Indian Council of Agricultural Research feeding standards to meet their

nutrient requirements (ICAR, 2013). Gir cows were hand milked twice a day at 4.00 - 6.00 A.M. in the morning and 4.00 - 6.00 P.M. in the evening and yields were recorded. Milking temperament of experimental Gir cows was observed and scores were awarded as per the following 4 point scale score card system (1 = docile, 2 = restless, 3 = nervous, 4 = aggressive) (Tamboli, 2018) at fortnightly interval in morning and evening milking. Observations of milk let down time and milking time was recorded by digital stop watch. Milk yield was recorded by using a dial type weighing balance. Milk flow rate (kg/min) was calculated by dividing the total milk yield (kg) with the time spent on milking (min). Milk samples, 20 mL each, were collected in dry, clean sample bottles and immediately taken to the laboratory for further analysis of milk composition (fat, protein, lactose, ash and total solid) using Lactoscan MCC Combo (Milkotronic Limited, Bulgaria).

Statistical analysis of experimental data was carried out by using Analysis of Variance to see the effect of temperament on milkability traits and milk composition. Pair wise mean differences were compared by 'Tukey' post hoc test and the difference was considered statistically significant at 5% ($p \leq 0.05$) (Snedecor and Cochran, 1994).

Results And Discussion

Temperament and Milkability Traits

Milk Let Down Time: The mean milk let down time increased significantly ($p \leq 0.05$) with increase in temperament score (Table 1). Docile cows took least (34.96 s) time for milk let down, while aggressive cows took maximum (50.63s) time. Similar results were reported by Shehar *et al*. (2015) in Gir cows and Chauhan *et al*. (2013) in Kankrej cows. The docile cows stood calmly and firmly, however aggressive cows moved continuously side by side. This may affect the release of oxytocin hormone in restless, nervous and aggressive cows, thereby prolonging their milk let down time.

Milking Time: The docile cows had significantly ($p \leq 0.05$) lowest (3.51 min) milking time followed by restless (4.39 min), nervous (5.53 min) and aggressive (5.99 min) cows (Table 1). Chauhan *et al*. (2013) reported highest milking time in Kankrej cows with aggressive temperament (4.78 min) as compared to docile temperament (3.60 min), and similar pattern was reported by Shehar *et al*. (2015) for docile (2.69 min) versus aggressive Gir cows (3.12 min). The present findings are also in agreement with Abdel-Hamid *et al*. (2017) and Kumar *et al*. (2019), who observed lower milking time in very calm cows (3.95 min and 2.78 min) than the nervous cows (8.98 min and 5.43 min, respectively). Generally the non-docile cows (restless, nervous and aggressive) are less cooperative to the milkers as observed in this study, which might have resulted in prolongation of milking time in different studies.

***Milk Yield per Milking*:** The docile cows had significantly ($p \leq 0.05$) higher milk yield (3.98 kg/milking) than other groups, which is in agreement with the previous studies conducted on Gir (Shehar *et al*., 2015), Kankrej (Chauhan *et al*., 2013), Vrindavani (Dutt *et al*., 2016) and Jersey (Kumar *et al*., 2019) cattle. In a similar line, Abdel-Hamid *et al*. (2017) also observed significantly higher milk yield ($p \leq 0.05$) in calmer Holstein cows compared to aggressive cows. Generally the non-docile cows are not completely milked by milkers due to their furious and aggressive behaviour. This might have resulted in lower milk yield in aggressive cows in the present study.

Milk Flow Rate: Temperament had significant ($P \leq 0.05$) effect on milk flow rate in Gir cows, where docile cows had higher milk flow rate (1.13 kg/min) followed by restless (0.81 kg/min), nervous (0.65 kg/min) and aggressive cows (0.52 kg/min) (Table 1). Shehar *et al*. (2015) also observed milk flow rate of 1.15 kg/min in docile Gir cows. Higher milk flow rate observed in docile Gir cows is in agreement with reports of Chauhan *et al*. (2013), Tamboli *et al*. (2018) and Kumar *et al*. (2019) in different breeds. The milk yield was higher in docile Gir cows, while milking time was lower. This resulted higher milking speed in docile animals compared to their non-docile counter parts.

Temperament and Milk Composition

Milk Fat: Cows with docile temperament had significantly ($p \leq 0.05$) highest milk fat percent followed by restless, nervous and aggressive (5.00, 4.17, 3.80 and 3.34%, respectively) (Table 2). Kumar *et al*. (2019) also observed significantly higher milk fat (%) in docile crossbred Jersey cows (4.79%) compared to aggressive cows (4.21%). This indicates that cows with aggressive temperament were not milked completely, though fat percent was significantly higher in stripped or last part of milk. However, Tamboli *et al*. (2018) observed significantly ($p \leq 0.05$) higher milk fat percent in restless cows (4.84%) than docile cows (4.44%) in hot humid season, but such effect was not observed in winter season. Moreover, Gergovska *et al*.

Table 1: Milkability traits of Gir cows with different temperament

Temperament	No. of obs.	Let down time (s)	Milking time (min)	Milk yield (kg/milking)	Milk flow rate (kg/min)
Docile (n=19)	404	$34.96^{a} \pm 0.24$	$3.51^{a} \pm 0.06$	$3.98^{c} \pm 0.07$	$1.13^{d} \pm 0.02$
Restless (n=9)	130	$38.75^{b} \pm 0.44$	$4.39^{b} \pm 0.13$	$3.54^{ab} \pm 0.12$	$0.81^{c} \pm 0.03$
Nervous (n=15)	181	$44.27^{c} \pm 0.58$	$5.53^{c} \pm 0.12$	$3.63^{bc} \pm 0.12$	$0.65^{b} \pm 0.02$
Aggressive (n=7)	85	$50.63^{d} \pm 1.17$	$5.99^{d} \pm 0.26$	$3.14^{a} \pm 0.18$	$0.52^{a} \pm 0.03$

n= Number of cows, Means with different superscript (a, b, c, d) differs significantly in a column ($p \leq 0.05$).

Table 2: Milk composition of Gir cows with different temperament

Temperament	No. of obs.	Fat (%)	SNF (%)	Lactose (%)	Protein (%)	Total solid (%)
Docile (n=19)	404	$5.00^{d} \pm 0.04$	$8.69^{c} \pm 0.02$	$4.75^{b} \pm 0.01$	$3.23^{b} \pm 0.01$	$13.69^{d} \pm 0.04$
Restless (n=9)	130	$4.17^{c} \pm 0.06$	$8.60^{bc} \pm 0.03$	$4.74^{b} \pm 0.02$	$3.16^{a} \pm 0.01$	$12.77^{c} \pm 0.07$
Nervous (n=15)	181	$3.80^{b} \pm 0.05$	$8.53^{b} \pm 0.04$	$4.67^{b} \pm 0.03$	$3.16^{a} \pm 0.02$	$12.33^{b} \pm 0.06$
Aggressive (n=7)	85	$3.34^{a} \pm 0.08$	$8.33^{a} \pm 0.07$	$4.51^{a} \pm 0.06$	$3.10^{a} \pm 0.03$	$11.67^{a} \pm 0.11$

n= Number of cows, Means with different superscript (a, b, c) differs significantly in column (P≤0.05).

(2014) observed non-significant effect of temperament on milk fat percent in dairy cows. The variation of results among different studies might be attributed to breed or the season during which the experiment was conducted.

Solid Not Fat (SNF): Significantly (p≤0.05) highest milk SNF content (%) was observed in docile cows (8.69%) and the lowest in aggressive cows (8.33%) (Table 2). The present findings are contrary to Gergovska *et al.* (2014), who reported non-significant difference in milk SNF per cent between nervous and calm categories of Black and White breed of cows. Tamboli *et al.* (2018) also did not observe significant effect of temperament on milk SNF per cent in Sahiwal cows. The assessment of temperament is subjective method and different authors follow different criteria, which might have resulted in inconsistent effect of temperament.

Milk Lactose: Milk lactose content was significantly lower (p≤0.05) in aggressive cows compared to docile, restless and nervous cows (4.51 vs. 4.75, 4.74 and 4.67%, respectively) (Table 2). Contrary to the present findings, Tamboli *et al.* (2018) observed similar milk lactose in docile and restless cows. Lactose is considered as least variable milk components in healthy dairy cattle and buffaloes, which might be attributed to non-significant variation between different temperament groups. However, in this study it varied among different temperament groups. Incomplete milking in aggressive animals might have affected lactose content in milk of Gir cows.

Milk Protein: The effect of temperament on milk protein per cent was significant (p≤0.05), where docile cows had higher milk protein (3.23%) as compared to all other groups (Table 2). Kumar *et al.* (2019) also found significant effect of temperament on milk protein percent in crossbred Jersey cows with the highest value in docile cows, and the lowest in aggressive cows. Contrary to the present study, Tamboli *et al.* (2018) observed significantly higher protein percent in cows with restless temperament (3.12%) as compared to docile cows (3.05%). Cziszter *et al.* (2016), observed significantly (p<0.05) higher milk protein percent in nervous cows compared to moderate temperament (3.34 vs. 3.18%), while Gergovska *et al.* (2014) found non-significant difference in milk protein percent between nervous and calm categories of animals.

Milk Total Solid: Milk total solid (%) was significantly (p≤0.05) higher in docile cows (13.69%) followed by nervous (12.33%), restless (12.77%), and aggressive cows (11.67%) (Table 2). The present findings are in contrast with Tamboli *et al.* (2018), who observed that total solid (%) was significantly higher in restless cows (14.19%) compared to docile cows (13.87%) in hot humid season. However, they did not observe any significant effect of temperament on milk total solid during winter season (13.98 vs. 13.86% in docile and restless cows respectively). The total solid content of milk is influenced by other milk components like fat, protein, lactose, salts etc. which might be attributed to variation in different studies.

Conclusions

Gir cows with docile temperament had lower milk let down time and milking time, but higher milk flow rate than restless, nervous and aggressive cows. Docile Gir cows had higher milk yield than restless and aggressive cows. Milk fat, protein and total solid (%) were higher in docile cows as compared to other cows. Moreover, milk solid not fat and lactose per cent were higher in docile cows as compared to aggressive cows. Thus, it is concluded that docile Gir cows have better milkability, milk yield and milk quality.

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