



Comparative studies on milk parameters and somatic cell count of Badri cattle over Sahiwal and crossbred counterparts

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India is one of the twelve mega biodiversity countries having 535.78 million of total livestock population and the cattle contribution is 35.94% (192.49 million). Total exotic/crossbred and indigenous/non-descript cattle population is 50.42 (26.9% increase as compared to 2012 census) and 142.11 million (6% decline as compared to 2012 census), respectively. India has diversified animal genetic resources and its cattle diversity is reflected in 50 well recognized breeds (DAHD 2019). In the past few years, preservation and conservation of indigenous germplasm has gained much attention and attempts are being made to improve the indigenous cattle breeds. Majority of these are draught breeds while some are dual purpose, with only five (Sahiwal, Red Sindhi, Gir, Tharparker and Rathi) being known for their milk proficiency.

The Indian system of medicine has described numerous benefits of Indian cow milk (Burjor 2007). Indian cows are very well-known for producing A2 beta-casein protein containing milk which is useful in hormonal disorders including diabetes, hypertension and dyslipidemia. On the other hand, milk containing A1 genotype of beta-casein has been considered harmful for health. Cow milk has proven to be the most nutritious food with the bio-protective effect having carotenes, vitamin A, vitamin B complex and vitamin C along with flavones, sterols and phenols. It has been found that cow milk composition does tend to vary among countries due to use of different breeds, feeding practices and breeding policies (Samkova *et al.* 2012). According to a research study conducted by the Uttarakhand State Council for Science and Technology, and IIT Roorkee, the milk of Badri cow contains almost 90% A2 beta-casein proteins which is one of the highest in any indigenous varieties. Badri is a registered indigenous cattle breed of Uttarakhand (ICAR-NBAGR 2016) and the

livestock owners of the state prefer Badri cattle over exotic as well as their crossbred counterparts in terms of religious importance (1st rank), better adaptability in hilly region (2nd), disease resistance (3rd) and medicinal properties of milk and urine (4th). Others include manure, livelihood generation, docile temperament, less labour and input required for its maintenance, taste of milk above crossbred and exotic breeds, better feed conversion efficiency, easy availability in local market and draught power (Joshi *et al.* 2018).

Milk somatic cells are a mixture of milk producing epithelial cells and immune cells, secreted in milk during the normal course of milking and are used as an index for estimating mammary health and milk quality of dairy animals. Milk somatic cell count (SCC) is quantified as the number of cells per ml of milk. When the amount of SCC is around one lakh, it indicates a healthy udder of the animal (Alhussien and Dang 2018). Somatic cells are primarily milk-secreting epithelial cells that have been shed from the lining of the mammary gland and white blood cells (leucocytes) that have entered the mammary gland in response to infection or injury (Dairyman's digest 2009). Milk SCC is affected by production level, stages of lactation, parity, effect of body weight and body condition score, season, milking, breed, physiological stage of the animal (Alhussien and Dang 2018).

This study was designed on comparative study of milk parameters and milk somatic cell count of Badri over other indigenous cattle breed, i.e. Sahiwal and crossbred cattle. Ten animals of each breed maintained at animal farm of Gobind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand were selected. Milk fat, protein, lactose, total solids, solid not fat (SNF), density, freezing point (automatic milk analyzer Lactostar, Funky Gerber, Germany) and milk somatic cell count (Schalm *et al.* 1971) were estimated. Hand milking was practiced and morning milk samples were taken. The data was presented as Mean±SEM and one-way analysis of variance (ANOVA) was performed using SPSS. Variables were analysed by Duncan's multiple range test with $p < 0.05$ level of significance.

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Table 1. Milk composition (%) and somatic cell count of Badri, Sahiwal and Crossbred cattle (n=10)

Parameter	Badri		Sahiwal		Crossbred		Level of significance
	Mean	SE	Mean	SE	Mean	SE	
Milk fat	4.58 ^b	0.26	4.17 ^{ab}	0.29	3.83 ^a	0.21	*
Milk protein	3.58 ^b	0.09	3.34 ^a	0.06	3.32 ^a	0.04	*
Milk lactose	4.03 ^a	0.40	4.78 ^b	0.08	5.14 ^b	0.07	*
Total solids	13.13	0.55	13.30	0.23	13.14	0.29	NS
SNF	8.55 ^a	0.55	8.55 ^a	0.15	9.31 ^b	0.10	*
Density	31.34 ^{ab}	0.92	30.44 ^a	0.48	32.42 ^b	0.31	*
Freezing point	0.45 ^a	0.07	0.57 ^b	0.02	0.60 ^b	0.01	*
Somatic cell count (SCC) (10 ⁶ µl)	0.78 ^a	0.06	1.03 ^{ab}	0.1	1.24 ^b	0.13	*

Each value represents mean of observation on ten animals. Mean values with different superscripts (^{a,b}) in rows differ significantly. *p<0.05.

The Mean±SEM values of milk fat, protein, lactose, total solids, SNF, density, freezing point and somatic cell count are represented in Table 1. All milk components except total solids varied significantly (p<0.05) among three breeds. Milk fat was significantly high in Badri (4.58±0.26) as compared to crossbred (3.83±0.21), however, the difference was non-significant (p>0.05) in Sahiwal cows (4.17±0.29). Similarly, Sharma *et al.* (2018) reported significantly higher (p<0.001) milk fat in indigenous cattle (4.99±0.16) as compared to Sahiwal (4.01±0.07) and crossbred (3.6±0.10). Badri cattle has significantly high milk protein (3.58±0.09) than Sahiwal (3.34±0.06) and crossbred cows (3.32±0.04). Significantly higher (p<0.01) protein content in indigenous cattle (3.37±0.10) than crossbred (3.09±0.14) and Sahiwal (3.03±0.08) was reported by Sharma *et al.* (2018). Lactose content was higher in crossbred (5.14±0.07) and Sahiwal cattle (4.48±0.08) in comparison to Badri cows (4.04±0.40), whereas, total solids levels were almost similar in all three breeds. However, Sharma *et al.* (2018) recorded higher lactose in Sahiwal (5.41±0.06) in comparison to indigenous (5.39±0.08) and crossbred cows (5.32±0.07). SNF levels were significantly higher in crossbred (9.31±0.10) as compared to Badri (8.55±0.55) and Sahiwal (8.55±0.15). Total solids content in three breeds showed no significant difference (p>0.05). Sharma *et al.* (2018) reported higher total solids in indigenous cattle (14.36±0.18) followed by Sahiwal (13.57±0.17) and crossbred (12.62±0.06). Density was significantly higher in crossbred (32.42±0.31) and lower in Sahiwal cows (30.44±0.48). Freezing point was significantly higher in crossbred cows (0.60±0.01) and Sahiwal (0.57±0.02) and lower in Badri cattle (0.45±0.07). Singh and Pratap (2012) reported higher milk fat and lactose in indigenous cattle as compared to crossbred cattle, whereas, protein and SNF content was higher in crossbred as compared to indigenous cattle. Milk SCC was proficient in crossbred (1.24±0.13×10⁶/ml) than Badri cows (0.78±0.06×10⁶/ml). Milk SCC in Sahiwal, Tharparkar, Karan Fries and Karan Swiss was found to be 1.26, 1.31, 1.61 and 1.54 (10⁶/ml), respectively (Singh 2002). Crossbred HF cows (4.14±0.17) showed significantly higher (p<0.05) SCC as compared to native breeds of Deoni (1.95±0.24) and Ongole (1.57±0.22) (Saravanam *et al.* 2015).

Indigenous breeds of cattle play a significant role in the livelihood of small farmers in rural areas of India. Badri cattle is a small sized dual-purpose breed mainly reared in hilly areas of Kumaun and Garhwal region of Uttarakhand. Badri cattle has slight edge over Sahiwal and crossbred in terms of milk fat and protein. Milk SCC is an indicator of both resistance and susceptibility of dairy cows to mammary infections. High milk SCC is undesirable from the standpoint of quality. However, too much low SCC will make the cows more prone to mammary infections.

SUMMARY

This study aims to provide reference values of some of milk parameters and somatic cell count of Badri cows as well their comparison with Sahiwal and crossbred counterparts. Lower milk SCC in Badri cattle reflects their resistance to mastitis. Further, the use of milk SCC as a management tool on a routine basis will help to maximize immunity and improve quality and quantity of milk as well as cattle's comfort and welfare. In India, higher milk production was never the reason for reversing Zebu/indigenous germplasm as quality of milk has been the talk of folklore. The data generated provides only meagre baseline information on comparison studies on milk composition of Badri, Sahiwal and crossbred cattle. Additional studies are required to substantiate the results.

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