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Compositional quality of buffalo raw milk in rural and urban areas of YSR Kadapa District, Andhra Pradesh

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Abstract

The present investigation evaluated the compositional quality and somatic cell count (SCC) of buffalo raw milk produced in rural and urban areas of YSR Kadapa district, Andhra Pradesh. Milk samples collected from buffalo milk producers were analyzed for fat, solid-not-fat (SNF), protein and SCC using standard analytical methods. The overall mean fat, SNF and protein contents were 7.07 ± 0.21 , 9.19 ± 0.10 and 3.78 ± 0.05 per cent, respectively, while the pooled SCC was $167.68 \pm 28.80 \times 10^3$ cells/ml. Urban buffalo milk recorded significantly higher ($p < 0.05$) fat, SNF and protein contents compared to rural milk, whereas SCC did not differ significantly between areas. No significant correlation was observed between SCC and milk constituents. Stage of lactation significantly influenced SCC ($p < 0.01$), with higher values during early and late lactation, while floor type had a significant effect ($p < 0.05$), with lower SCC in buffaloes housed on pucca floors. The study highlights the influence of management and housing conditions on buffalo milk quality in the study area.

Keywords: YSR Kadapa District, Buffalo milk, milk composition, somatic cell count, rural and urban

1. Introduction

Buffalo milk constitutes a major share of India's milk production and is preferred because of its higher fat, protein and total solids content compared to cow milk (Rangappa and Achaya, 1974; Walstra *et al.*, 1999) ^[1, 2]. The compositional quality of milk is an important determinant of its nutritive value, processing suitability and economic returns to milk producers. Milk constituents such as fat, solid-not-fat (SNF) and protein are influenced by species, feeding practices, stage of lactation and management conditions (De, 1980; Lingathurai *et al.*, 2009) ^[3, 4]. Somatic Cell Count (SCC) is widely recognized as a reliable indicator of udder health and hygienic quality of milk. Increased SCC is generally associated with mastitis and results in deterioration of milk quality and processing characteristics (Schultz, 1977; IDF, 1997) ^[5, 6]. Although buffaloes usually exhibit lower SCC than cows, variations occur due to physiological factors such as parity and stage of lactation, and management factors including housing hygiene (Dang and Anand, 2007; Moroni *et al.*, 2006) ^[7, 8].

Rural and urban dairy production systems differ considerably in terms of feeding intensity, housing facilities and milking management practices, which may significantly influence milk composition and hygienic quality (Kumar *et al.*, 2011) ^[9]. However, systematic information on the compositional quality and SCC of buffalo milk under rural and urban conditions in YSR Kadapa district is limited. Hence, the present study was undertaken to evaluate the compositional quality and somatic cell count of buffalo raw milk in rural and urban areas of YSR Kadapa District.

2. Materials and Methods

Milk samples were collected from buffaloes maintained by selected rural and urban milk producers following standard hygienic procedures. Prior to sampling, teats were cleaned and the first few streams of milk were discarded to minimize contamination, as recommended for raw milk quality assessment (IDF, 1997) ^[6]. Milk fat, SNF and protein contents were estimated using a Lactan 1-4 milk analyzer based on infrared spectrometry.

Infrared-based milk analysis is widely accepted for rapid and reliable estimation of milk constituents (Walstra *et al.*, 1999) [2]. Somatic cell count was determined using a DeLaval Somatic Cell Counter (DCC), and values were expressed as cells $\times 10^3$ /ml of milk. SCC is a recognized indicator of udder health and milk hygiene (Schultz, 1977; IDF, 1997) [5, 6].

Buffaloes were categorized based on parity and stage of lactation to study their influence on SCC. Classification of animals according to lactation stage is commonly adopted in dairy research to assess physiological effects on milk quality (Dang and Anand, 2007) [7]. Housing floor type (kutcha or pucca) was recorded as a management factor influencing udder health and milk hygiene (Moroni *et al.*, 2006) [8].

Statistical analysis of the data was carried out to test the significance of differences between rural and urban areas and among physiological and management factors. Correlation analysis was performed to study the relationship between SCC and milk constituents following standard statistical procedures (Snedecor and Cochran, 1994) [10].

3. Results

Compositional quality and SCC of buffalo milk

The compositional quality and SCC of buffalo raw milk are presented in Table 1. Urban buffalo milk recorded significantly higher ($p<0.05$) fat, SNF and protein contents compared to rural milk. Although SCC values were numerically lower in urban milk, the difference between rural and urban areas was not statistically significant.

Relationship between SCC and milk constituents

Correlation coefficients between SCC and milk constituents are shown in Table 2. No significant correlation was observed between SCC and fat, SNF or protein content in rural, urban or pooled samples.

Influence of physiological and management factors on SCC

Parity did not significantly influence SCC, though values increased numerically with advancing parity. Stage of lactation had a significant ($p<0.01$) effect on SCC, with higher values during early and late lactation. Floor type significantly ($p<0.05$) influenced SCC, with lower values observed in buffaloes housed on PUCCA floors (Table 3).

4. Discussion

The compositional quality of buffalo milk observed in the present study confirms the inherent richness of buffalo milk in terms of fat, SNF and protein, as reported earlier (Rangappa and Achaya, 1974; Walstra *et al.*, 1999) [1, 2]. Significantly higher fat, SNF and protein contents in urban buffalo milk compared to rural milk may be attributed to better feeding practices, improved housing facilities and relatively intensive management systems followed by urban milk producers. Similar improvements in milk composition under better management conditions have been reported by Lingathurai *et al.* (2009) and Kumar *et al.* (2011) [4, 9].

The pooled SCC values recorded in the present study were comparatively low, indicating good udder health status in buffaloes. The absence of significant differences in SCC between rural and urban areas suggests that location alone may not be a decisive factor influencing SCC levels. Furthermore, the lack of significant correlation between SCC and milk constituents indicates that variations in SCC within the observed range did not markedly affect milk composition. Comparable observations have been reported in buffaloes by

Dang and Anand (2007) [7], who noted that milk composition remains relatively stable despite moderate changes in SCC. Physiological factors, particularly stage of lactation, significantly influenced SCC, with higher values observed during early and late lactation. Increased SCC during early lactation may be associated with physiological stress following parturition, whereas higher SCC during late lactation may result from reduced milk yield and increased concentration of somatic cells (Schultz, 1977; IDF, 1997) [5, 6]. Among management factors, floor type significantly influenced SCC, with buffaloes housed on pucca floors recording lower SCC values. Improved drainage and better hygiene associated with pucca flooring may reduce environmental contamination and udder infections, supporting earlier reports by Moroni *et al.* (2006) [8].

Table 1: Compositional quality and somatic cell count of buffalo raw milk in rural and urban areas of YSR Kadapa district

Area	Fat (%)	SNF (%)	Protein (%)	SCC ($\times 10^3$ cells/ml)
Rural (N=30)	6.52 \pm 0.27	8.99 \pm 0.17	3.59 \pm 0.08	191.57 \pm 45.40
Urban (N=30)	7.63 \pm 0.30*	9.40 \pm 0.12*	3.98 \pm 0.06*	143.80 \pm 35.72
Overall (N=60)	7.07 \pm 0.21	9.19 \pm 0.10	3.78 \pm 0.05	167.68 \pm 28.80

Table 2: Correlation coefficient (r) between SCC and milk constituents of buffalo milk

Parameter	Rural	Urban	Overall
SCC vs Fat (%)	0.09	-0.10	-0.03
SCC vs SNF (%)	0.09	0.19	0.09
SCC vs Protein (%)	0.04	0.53	0.15

Table 3: Influence of physiological and management factors on SCC of buffalo milk

Factor	Category	SCC ($\times 10^3$ cells/ml)
Parity	1	142.35 \pm 42.85
	2	154.11 \pm 55.88
	3	182.30 \pm 66.16
	4	194.93 \pm 66.85
Stage of lactation (days)	0-60	141.53 \pm 13.91**
	61-120	92.88 \pm 45.45
	121-180	112.78 \pm 62.50
	181-240	331.33 \pm 69.37

5. Conclusions

Buffalo milk produced in YSR Kadapa district is rich in fat, SNF and protein. Urban buffalo milk exhibits significantly better compositional quality than rural milk. Somatic cell count is not significantly associated with milk constituents. Stage of lactation and housing floor type significantly influence SCC in buffalo milk. Improvement in housing hygiene, particularly adoption of pucca flooring, can enhance milk quality.

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Conflict of Interest

Not available

Financial Support

Not available

Reference

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