COMPARATIVE STUDY ON MILK COMPOSITION AND SOMATIC CELL COUNT BETWEEN HEALTHY KOSALI AND THARPARKAR BREED OF CATTLE

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ABSTRACT

Kosali is a new cattle breed of Chhattisgarh planes in which composition of the milk remain unestablished till now. The present study established the milk composition and somatic cell count in healthy Kosali cow in comparison with Tharparkar breed. Fifteen animals, each from Kosali and Tharparkar cows at early lactational stage were used to study milk composition. The percentage of fat, protein, total solid and solid not fat in the milk of Kosali breed was significantly lowered than Tharparkar. Lactose percentage in the milk of both Kosali and Tharparkar cow was comparable. Milk enzymes viz. lactate dehydrogenase, alkaline phosphatase, aspartate aminotransferase and average milk somatic cell count differed non-significantly between healthy Kosali and Tharparkar. The current study established the nutritional and enzymatic composition of the milk of Kosali breed in relation to Tharparkar

Key words: Milk composition, Somatic cell count, Kosali, Tharparkar

INTRODUCTION

Milk is the primary source of nutrients for newborns. Chemical composition of milk is very crucial for its nutritional quality (Badriah et al., 2013). Constituents in milk provide immunity, energyand the building blocks necessary for growth (Hailu, 2013). Composition of milk varies according to breeds of cattle (Yang et al., 2013). Almost all studies on milk composition have involved the dairy breeds of European origin. These breeds have been purposefully developed to produce high volumes of milk, and even specific nutrients (Yang et al., 2013). In India, breeding of indigenous cattle was based mainly on survivability against environmental conditions and diseases, rather than improvement in milk quality (Sudhakar et al., 2013).

Very little is known about the milk composition of indigenous breeds of cattle (Hailu, 2013).Milk composition and quality is a matter of concern among the general public that can't be overlooked. Kosali is a local cattle breed of plain region of Chhattisgarh. Recently it has been registered as "INDIAN CATTLE 2600" "KOSALI 03036" as new cattle breed of Chhattisgarh state. It is small sized breed, highly heat tolerant and has disease resistant capability. Literature is absolutely silent regarding the milk composition and somatic

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cell count in Kosali. In the present study, we analyzed some of the major nutritional constituents, somatic cell count and different enzymes in the milk of Kosali to compare it with the Tharparkar cattle. The knowledge on milk composition will be helpful in diagnosis of mammary gland diseases during lactation as well as in development of breeding programsfor improving the nutritional quality of milk in Kosali breed.

MATERIALS AND METHODS

Experimental protocols of this study have been approved by the Institutional animal ethical committee (IAEC) of the Chhattisgarh Kamdhenu University, Durg, Chhattisgarh. All the experiments were carried out according to the guidelines of the IAEC. Lactating Kosali (n=15) and Tharparkar (n=15) cows during 1st lactation at early stage were selected from private owners of Anjora village, Chhattisgarh, India. The information of individual cow during early stage of lactation was recorded prior to the commencement of testing. The selected cows were having no abnormality in udder and milk and has normal physiological parameters i.e. temperature, pulse and respiration. Each milk sample collected from Kosali and Tharparkar cows represented milk from four different teats of a cow pooled together. Three sampling was done from each animal at an interval of 30 days to complete early stage of lactation. After proper disinfection of teat surface with 70% ethyl alcohol, milk samples (60 ml) were collected aseptically in duplicate after squirting few streams from each teat (Dandareet al., 2014). Sterile polyethylene screw capped wide mouth vials were used for collection of samples. The vials were kept in an ice box and carried to the laboratory for further analysis. Protein%, fat%, lactose%, total solid% andsolid not fat (SNF) % in the milk were analyzed within one hour of its collection by using milk analyzer (Milk-Lab Pro, U.K. Ltd) as per Dandare et al., 2014. Somatic cell count in milk was performed within 1 hour of its collection to minimize disintegration of leukocyte (Schalm et al.,1971). Milk enzymes viz. lactate dehydrogenase (LDH), alkaline phosphatase (ALP) and aspartate aminotransferase (AST) were estimated in sera by standard kit method using semiautomatic chemistry analyzer (RA 50). Milk serum was prepared by a two- step centrifugation procedure (Dandare et al., 2014). First, milk samples were centrifuged at 3000 rpm for 10 min to remove the cream and cells. Samples were then treated with 0.1 M hydrochloric acid at the controlled pH of 4.8 for 20 minute for casein precipitation. Treated samples were again centrifuged and the supernatants were collected as milk sera and used for analysis of different enzymes. Data obtained were analyzed by student's t-test and p value < 0.05 were considered as significant. Pearson's correlation coefficient was used to determine significant correlations. All analysis was performed using statistical package for social science (SPSS) version 16.0.

RESULTS AND DISCUSSION

Fat%, protein%, lactose%, SNF% and total solid%in the milk samples of Kosali and Tharparkar breed is given in Table. 1. Results illustrated that average fat%, protein%, SNF% and total solid% were significantly ($P<0.05$) lowered in the milk of Kosali compared to Tharparkar. The decrease in fat%, protein%, SNF% and total solid% was observed to be 1.54-, 1.30-, 1.15- and 1.19- fold respectively. The lactose% differed non-significantly between the two breeds, with Kosali showing 1.02 fold decrease compared to Tharparkar. Correlation studies (Table. 2) between different milk parameters revealed significant ($p<0.05$) positive correlation of fat, protein and SNF with total solid both in Kosali and Tharparkar cow. Table. 3 depict the somatic cell count and concentration of some enzymes in milk of Kosali and Tharparkar cow. Non-significant variation in milk somatic cell count, activity of LDH, AST and ALP was observed between Kosali and Tharparkar. However, LDH, AST and ALP activity showed

1.05-, 1.07- and 1.07- fold increase respectively with somatic cell count 1.08 fold decreased in Kosali compared to Tharparkar breed. Result of our study was in agreement with the findings of previous studies (Mahmood and Usman, 2010 and Yu et al., 2011) in the milk of healthy cows. Milk composition is affected mainly by environment and inherited factors (Adesina, 2012). Diet of the cow is the ultimate source of most nutrients required for synthesis of milk. Feeding conditions and the rations used also influence the milk composition in dairy cows (Hojer et al., 2012). Quantity and quality of available fodder and climatic variation have direct impact on quality and quantity of milk and its constituents (Sharif et al., 2009). Kosali cattle survive mainly by consuming paddy straw and hardly any concentrate feed or mineral mixture, which might be the reason for lowered milk fat content. Overfeeding of animals will not affect the milk protein and SNF content but underfeeding will reduce the milk yield, protein percentage and content of SNF in milk (Hojer et al., 2012). Kosali cattle are usually underfed as they totally depend on grazing to full fill their appetite which may be the cause of lowered protein% and SNF%. Significant decrease in total solid content in the milk of Kosali cattle might be attributed to low level of fat%, protein% and SNF% as observed in our study. Enzymes in milk are associated with the cell specific componentsof mammary epithelium. Most enzymes enter milk due to specific mechanism by which milk constituents are excreted from the secretory cells (Fox and Kelly, 2012). Alteration in milk somatic cell count and enzymes were rarely observed in healthy bovines unless affected with some specific diseases of mammary gland (Mahmood and Usman,2010) which clearly supports the current results.

In conclusion, our study provided some information regarding the nutritional composition of milk in Kosali and Tharparkar cow. It suggests for the instigation of breeding plans specifically aimed to improve the quality of milk in Kosali breed of cattle.

Table.1

Chemical composition of milk in Kosali and Tharparkar cow. Data were presented as Mean ± SE and each sample was analyzed in duplicate.

Prarameters (%)	Kosali (n=15)	Tharparkar (n=15)	Fold decrease in Kosali compared to Tharparkar
Fat	2.66^{a}±0.15	4.12^{b} ±0.10	1.54
Protein	3.01^{a}±0.06	3.92^{b}±0.04	1.30
Lactose	4.42^{a}±0.05	4.51^{a}±0.05	1.02
Solid Not Fat	7.13^{a}±0.11	8.50^{b}±0.11	1.15
Total Solid	10.53^{a}±0.28	12.62^{b}±0.16	1.19

Means with different superscripts in a row differ significantly ($p< 0.05$)

Table. 2

Relation between different milk parameters in Kosali and Tharparkar cow

Parameters	Pearson's correlation coefficient (r)	
	KosaliTharparkar	
Fat Vs. Total Solid	6.22*	6.47*
Protein Vs. Total Solid	4.73*	5.13*
Solid not fat Vs. Total Solid	6.21*	6.43*

*Significant at $p<0.05$

Table.3

Somatic cell count and concentration of some enzymes in milk of Kosali and Tharparkar cow. Data were presented as Mean ± SE and each sample was analyzed in duplicate.

Paramters	Kosali (n=15)	Tharparkar (n=15)	Fold change in Kosali compared to Tharparkar
Lactate dehydrogenase (U/L)	150.07^{a}±4.67	142.33^{a}±3.57	+1.05
Alkaline phosphatase (U/L)	34.73^{a}±1.65	32.40^{a}±1.64	+1.07
Aspartate aminotransferase (U/L)	70.20^{a}±3.23	65.27^{a}±3.33	+1.07
Somatic cell count (x 10^{5})/ml	1.23^{a}±0.47	1.34^{a}±0.38	-1.08

Means with same superscript in a row differ non-significantly($p>0.05$)

SUMMARY

The present study revealed that fat%, protein%, TS%, SNF% were significantly lowered in milk of Kosali cattle compared to Jersey, but lactose% in milk of both Kosali and Tharparkar cow was comparable. Non-significant difference in somatic cell count and milk enzymes was observed between Kosali and Tharparkar cow. Results of our study provide some information regarding the nutritional composition of milk in Kosali. It also suggests for the instigation of breeding plans specifically aimed to improve the quality of milk in this breed.

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