

Buffalo Milk: Seasons and Adulterants

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ABSTRACT

Buffalo milk quality including fat, protein, and total solids varied as a function of season. Therefore, various types of adulterants are added to buffalo milk by suppliers to enhance the parameters because these parameters are used by milk processors as indicators to calculate the payout to the milk suppliers. Frequently used adulterants were skim milk, starch, urea, and detergents.

Introduction

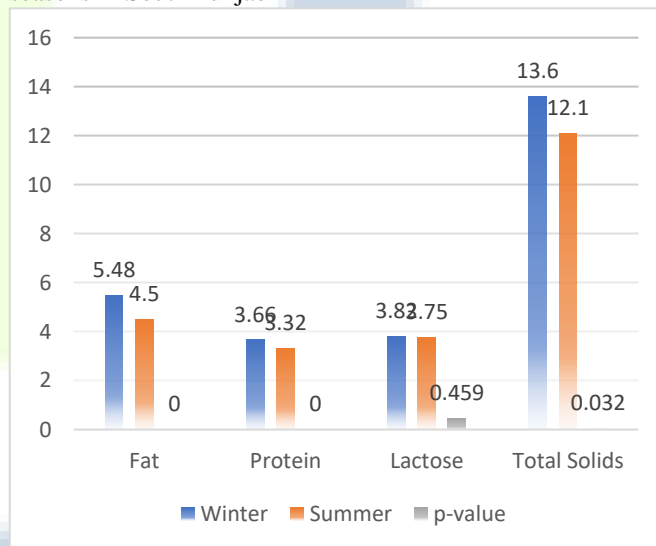
Buffalo milk is considered an essential human diet that contains several nutrients such as fats, proteins, and carbohydrates and is enriched with vitamins and minerals. In Pakistan, buffalo milk is usually preferred by consumers owing to its rich nutritional quality. Buffalo milk is considered unique due to its low cholesterol content coupled with high calories that make it a healthy diet. Therefore, it is essential or develop a strong skeleton and decrease cardiovascular disorders. Moreover, buffalo milk is also considered suitable for preparing several dairy products including yogurt, cottage cheese (paneer), and traditional dairy products including ghee and khoa [1]. In Punjab traditional feeding system prevails for livestock where animals are fed on forages throughout the year, except in extreme winter and late spring when the high shortage of green forage occurs, and dairy animals are fed only on crop by-products along with available green fodder. Since deficiency of a balanced diet is directly associated with compositional variations in buffalo milk. Therefore, damaging the nutritional properties of milk and the quality of manufactured dairy products.

Adulteration of buffalo milk

The adulteration of milk is a deliberate action for damaging its quality by the addition of extraneous injurious ingredients. Major driving forces of buffalo milk adulteration are either to earn extra money by bridging the demand and supply gap or to improve the quality indicators to enhance milk quality. Although the motivation for milk adulteration is considered an economic one it is also of major public health concern. The consumers of adulterated buffalo milk are affected by several critical health disorders including diarrhea, ulcers, kidney damage, and disturbance of the circulatory system [2]. The unethical act of adding chemicals in buffalo milk makes it unfit for processing to meet the legal standards and brings negative consequences leading to major economic losses for the dairy industry and several human health hazards from infants to elderly people.

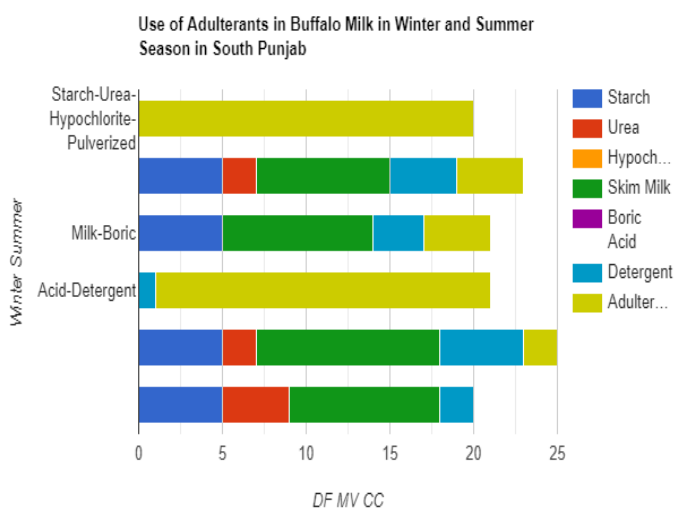
One hundred milk samples were collected from various cities in southern Punjab in the summer and winter seasons. Milk composition was estimated. It was found that during extreme seasonal phases of the South Punjab region milk composition deteriorated specifically milk fat, protein, and total solids (TS) as shown in Figure (1).

Figure 1. Buffalo milk composition in winter and summer seasons in South Punjab



Buffalo milk adulteration was also estimated in hundred milk samples collected from dairy farms local vendors, and commercial chillers. All milk samples were analyzed in the Milk Testing Laboratory Punjab Food Authority, Multan. For the detection of adulterants (starch, urea, hypochlorite, pulverized soap, formalin, sugar, skim milk, boric acid, and detergent) user-friendly Latte Adulterazione kit was used according to the manufacturer's protocol. Milk samples collected in the winter season were detected with the use of skim milk, starch, detergent, and urea as adulterants. Milk samples collected in the summer and winter seasons were detected with the use of skim milk, detergent, starch, and urea as milk adulterants.

Figure 2. Use of Adulterants in Buffalo Milk in Winter and Summer Season in South Punjab



Buffalo milk contents change both in the winter and summer seasons. Milk samples showed a major difference in milk composition in both seasons. Specifically, variation in the fat content of milk was observed with changes in season [3]. The decrease in fat content is associated with the length of daylight. The wide ratio between daylight and dark is associated with a lower proportion of fat due to an increase in the level of prolactin secretion. The concentration is higher in plasma in summer as compared to the winter season [4]. Since the quantity of milk fat content depends on the acetate quantity in the rumen. Grain feeding results in low production of acetate in the summer season and ultimately in low-fat content in milk [5]. Buffalo milk protein composition also changes with season variation [3]. Milk protein change is attributed to a protein-rich diet in the winter season while in summer the diet is deficient in protein content [6,7]. The fat and protein contents are directly proportional to each other as both increased in winter and decreased in summer. Total solids composition also altered with variation in the fat content of milk [8]. Therefore, cheese from buffalo milk gives the best yield in the winter season as compared to the summer season based on high total solids content. The lactose content showed almost the same concentration in winter and summer. Milk lactose content remains almost unchanged throughout the year. Milk content variation in both seasons might be related to changes in the quality of fodder and the quantity of water consumed by buffaloes.

South Punjab survey showed excessive use of skim milk powder as an adulterant in raw milk. Excessive adulteration with skim milk for thickening the milk is of major public health concern as it contains a lethal form of oxidized cholesterol. Moreover, expired, or poor-quality skim milk adulteration is done for economic advantage simply by ignoring human health concerns [1]. Urea is also used to increase shelf life and to increase the non-protein nitrogen content of buffalo milk. Urea adulteration is associated with vomiting, gastroenteritis, and damaging effects on the kidneys, heart, and liver. Starch is also used to increase density and solid not fat (SNF) content in buffalo milk. Starch adulteration results in gastroenteritis and its storage in the body might be fatal for hyperglycemic patients [9]. Detergents are also used for emulsification and enhancing frothiness, a well-desired characteristic of milk. Consumption

of adulterated milk leads to conditions like kidney damage and gastroenteritis [10]. Milk adulteration practice is not adopted by dairy farmers, but middlemen and chiller owners are engaged in an unethical activity of adulteration to avoid the economic losses associated with spoilage of milk during its transportation and sale. In Pakistan, the common use of formalin, boric acid, and hydrogen peroxide as milk adulterants has been reported frequently [11]. Milk samples under our consideration were found negative for all those adulterants. The availability of multiple adulterants serving the same purpose by enhancing desirable milk parameters might be one possible reason. Therefore, people engaged in such unethical activity of adulteration might use them according to their suitability in terms of access and cost.

Conclusion

Buffalo milk quality parameters including fat, protein, and total solids (TS) change as a function of season. These parameters are indicators for milk processors and the calculation of payout to the milk suppliers. Therefore, various adulterants are added to milk by suppliers to enhance the desired parameters and improve milk quality throughout the year. The extent of adulteration was quite high in milk samples collected from local milk vendors and commercial chillers. None of the dairy farms engaged themselves in unethical activity of milk adulteration. Milk samples were found to be adulterated with skim milk, starch, urea, and detergents in South Punjab Pakistan. Consequently, to provide healthy and nutritious milk to consumers strict monitoring measures are required for control of adulteration in milk and dairy products.

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