



Adulteration of Raw Milk in Selected Regions of Tangail District of Bangladesh

L. Bari, M. R. Hoque*, M. S. A. Reza, M. A. Hossain and A. Islam

Department of Food Technology and Nutritional Science
Mawlana Bhashani Science and Technology University, Santosh, Tangail-1902

* Corresponding author: h.riadul09@gmail.com

Abstract

At the present time adulteration of food especially raw milk is becoming a burning issue. Normally milk is adulterated with water, starch, skim milk powder, sugar, detergent, and fat, recently formalin also added with milk to increase the shelf life of milk. That's why it is very essential to detect the prevalence of adulteration of milk. The present experiment was conducted to know the adulteration of milk. Total thirty milk samples were collected from five different bazaars (Tangail town, Santosh Bazaar, Porabari Bazaar, Boilla Bazaar, Bajitpur Bazaar) of Tangail district where six samples were taken from each entry point. The mean Specific gravity was 1.021, 1.020, 1.019, 1.019 and 1.020 respectively which were lower than standard 1.032 (BSTI, 2000). The results clearly suggest that water was the most common adulterant in almost all sample of raw milk collected. 56.67% and 50% samples were adulterated with starch and skim milk powder respectively. Two types of preservatives namely borax and sodium bicarbonate were detected in the fluid milk from the study areas. Out of all samples, 23.33% was adulterated with sodium bicarbonate and 16.66% with borax. However, none of the samples contained either formalin or hydrogen peroxide. It could therefore be inferred that, the consumers need to be more cautious regarding the quality of raw milk.

Key words: Adulteration, Raw milk, Starch, Skim milk powder, water

Introduction

Milk has been recognized as an almost complete food, it supplies nutrients like good quality proteins, fat, carbohydrates, vitamins and minerals in significant amount than any other single food (Neumann *et al.* 2002). Milk is the lacteal secretion, practically free from colostrums, obtained by the complete milking of healthy cows, five days after and 15 days before parturition, which contains not less than 8.5 percent milk solids-not-fat and not less than 3.5 percent milk fat (U.S. Public Health Service, 1965 and Itzerott, 1960). Although milk contains all the nutrients adequately but now a day's milk is adulterated in a wide varieties of way. Producer adopt this way by considering the profit and to meet the gap between demand and production. Adulteration is an act of intentionally debasing the quality of food offered for sale either by admixture or substitution of inferior substances or by the removal of some valuable ingredients (FDA, 1995). However, Adulteration of milk is usually done by adding inferior cheaper materials or elements like pond water, cane sugar and powdered milk (Prasad, 1999). A study conducted by Chanda *et al.* (2012) in Barishal district of Bangladesh founded that all of the milk samples were adulterated with water irrespective of collection points and months. Cane sugar, powdered milk, starch, formalin and sodium bicarbonate were also detected. Haasnoot *et al.* (2004) showed that milk adulteration, poor hygiene, malpractices, lack of preservation technology, cooling facilities and sanitation conditions are the main cause of losses in quantity and poor quality of milk. This adulterated milk may cause various diseases to the consumers. Water decreases the nutritive value of milk which if contaminated poses a health risk especially to

infants and children. Starch can cause diarrhea due to the effects of undigested starch in colon and may prove very fatal for diabetic patients. Detergents cause gastrointestinal complications (Singuluri and Sukumaran, 2014). Octylphenol and nonylphenol parts of detergents cause breast cancer (Ali *et al.* 2005). Formalin causes vomiting, diarrhea and abdominal pain. Larger doses may cause decreased body temp, shallow respiration, and weak irregular pulse and unconscious (Gwin *et al.* 2009). By considering the harmful effect of adulteration, this study was conducted to detect the adulteration of milk in the Tangail sadar upazilla of Tangail district.

Materials and Methods

Study area

A cross sectional study was carried out among the five different bazar (Tangail town, Santosh Bazaar, Porabari Bazaar, Boilla Bazaar, Bajitpur Bazaar) of Tangail Sadar upazilla. It took six months (April to September 2014) to carry out the experiment, under the department of Food Technology and Nutritional Science, MBSTU.

Collection of samples

A total 30 sample each sample contain 250 ml were collected by sterilized bottle. The samples were immediately cooled in a cool box containing Ice Packs. The milk was analyzed in the laboratory within 2 hours from arrival.

Adulteration detection methods

Preparation of sample

The sample was prepared according to the DGHS (2005). The sample was warm to 37°C to 40°C then it was transferred to the beaker and allows the

sample to come to room temperature (26°C-28°C) and withdraw immediately for analysis.

Detection of starch in milk

After preparation of the sample about 5 ml of milk was taken in a test tube. Then 1-2 drops of iodine solution was added to the test tube. Development of blue/blue black color indicates presence of starch which disappears when sample is boiled and reappears on cooling.

Detection of skimmed milk powder in natural milk

After preparation of the sample about 5 ml of milk was taken in a test tube. It was then stirred properly. Nitric acid was then added drop by drop with a dropper. Development of orange color, it indicates the milk is adulterated with skim milk powder. Samples without skim milk powder show yellow color.

Detection of water

Adulteration of milk with water was checked by lactometer reading. The raw milk was poured into a (100 ml) measuring cylinder and a lactometer was dropped in the milk to slowly sink down. Further, the lactometer reading was taken and recorded in Lactometer degree (°L). The temperature during measuring was approximately 20-22°C. If the reading is below the standard then it was considered to be adulterated with water.

Determination of specific gravity

The specific gravity was measured by using the following formula using lactometer reading: Milk density = 1 + (lactometer reading 1000⁻¹)

Detection of formalin

Formalin detection was done by formalin detection KIT developed by Institution of Food Science and Technology (BCSIR).

Detection of sodium bicarbonate, hydrogen peroxide and borax

The type of preservatives added to the fluid milk was detected by using chemical tests. All tests were conducted as per DGHS (2005).

Results and Discussion

The adulterants of raw milk collected from these five different places are presented in Table 1. It shows that among five different Bazaar except two sample of Tangail Town lactometer reading is lower than standard (28°L to 32°L) (BSTI, 2000) which is almost similar to the findings of Chanda *et al.* (2012) it was observed that all samples collected from five different entry points were adulterated with water throughout the whole study period. This is due to the availability of water and to increase the volume and also to neutralize the developed acidity of fluid milk for prolonged shelf life.

Starch was detected as adulterant by 66.67% of the milk samples collected from Tangail Town and Santosh Bazar, 50% sample was adulterated with starch in Porabari bazaar and Bajitpur Bazar. The results of starch detection totally disagreed with the results of Islam *et al.* (2013) who found that no milk was adulterated with starch. Skim milk powder was detected by 50.002% of all samples. However, maximum 66.67% of the milk samples collected from Porabari and Bajitpur was found to be adulterated with powdered milk. Interestingly, samples collected from Boilla bazaar shows 16.67% adulterated with skim milk powder. But all of the samples were totally free from adulterated with cane sugar.

Table 1. Presence of adulterant (% positive sample) in the raw milk collected from different points of Tangail district (N = 30)

Adulterant	Tangail Town	Santosh Bazar	Porabari Bazar	Boilla Bazar	Bajitpur Bazar	Average	Sig. level
Water	66.67	100.00	100.00	100.00	100.00	93.33	*
Starch	66.67	66.67	50.00	33.33	50.00	53.33	*
Skim milk powder	50.00	50.00	66.67	16.67	66.67	50.00	*
Cane sugar	0.00	0.00	0.00	0.00	0.00	0.00	NS

NS, non-significant ($p > 0.05$); *, $p < 0.05$

The specific gravity of milk was ranged from 1.015 to 1.029 as presented in Table 2. The results of specific gravity indicates that milk collected from five bazaar except two sample of Tangail town was adulterated with water it was similar to Lateef *et al.*

(2009) he observed that the specific gravity of cow's milk was (1.02 ± 0.010). But the range of specific gravity of milk sample collected from Sombhuganj bazaar was 1.027 to 1.032.

Table 2. Specific gravity of milk samples collected from 5 local markets of Tangail

Sample no	Tangail town	Santosh Bazaar	Porabari Bazaar	Boilla Bazaar	Bajitpur Bazaar
Sample 6 1	1.019	1.019	1.015	1.020	1.018
Sample 6 2	1.018	1.022	1.017	1.015	1.019
Sample 6 3	1.018	1.020	1.019	1.013	1.019
Sample 6 4	1.019	1.010	1.023	1.019	1.020
Sample - 5	1.029	1.014	1.020	1.018	1.021
Sample 6 6	1.028	1.022	1.022	1.015	1.021

Table 3. Presence of preservatives (% positive sample) in the raw milk collected from different points of Tangail district (N = 30)

Preservatives	Tangail Town	Santosh Bazar	Porabari Bazar	Boilla Bazar	Bajitpur Bazar	Average	Sig. level
Sodium bicarbonate	33.33	16.67	33.33	0.00	33.33	23.33	*
Hydrogen peroxide	0.00	0.00	0.00	0.00	0.00	0.00	NS
Borax	33.33	16.67	16.67	0.00	16.67	16.66	*
Formalin	0.00	0.00	0.00	0.00	0.00	0.00	NS

NS, non-significant ($p > 0.05$); *, $p < 0.05$

In raw milk, chemicals are added to increase the shelf life. In this study, milk samples were tested for detecting borax, hydrogen per oxide, sodium bicarbonate and formalin. On average, 23.33% of the milk samples were detected as sodium bicarbonate positive (Table 3) and 16.66% of the milk samples were detected as borax positive. Hydrogen peroxide and formalin were not detected in any sample of the study area. This result is a bit different from the findings of Debnath *et al.* (2009) and Das *et al.* (2010) who found only formalin as added preservative in raw milk in Chittagong metro-politan area.

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