



# Comparative Study on Composition and Adulteration of Milk Sold at Thane

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## ABSTRACT

The study was conducted to evaluate physiochemical quality of milk samples and adulteration in milk sold in Thane City during the year 2017. Ten loose buffalo milk samples were collected from selected dairy shop of Thane City. The samples were analyzed for fat, solid-non-fat (SNF), protein, acidity, specific gravity, PH, neutralizers and adulterants. Our analysis showed that the milk samples analyzed were free from adulterants like detergent, sugar, starch, salt, hydrogen peroxide, urea, ammonia, nitrates. Acidity ranges from 0.117 to 0.146%, fat from 2.7 to 6.0%, Protein from 2.46 to 2.90%, SNF from 7.11 to 9.37%, Specific gravity from 1.023 to 1.032. The statistical analysis showed that the fat, protein, SNF of these samples were significantly different.

**Keywords:** buffalo Milk, physical and chemical examination, Adulterants, Comparison.

## I. INTRODUCTION

Milk is an almost ideal food. It has high nutritive value. It supplies body-building proteins, bone-forming minerals and health-giving vitamins and furnishes energy giving lactose and milk fat. Besides supplying certain essential fatty acids, it contains the above nutrients in an easily digestible and assimilable form. <sup>(1)</sup> Milk is good source of calcium, phosphorus and fat-soluble vitamins (A, D, E and K). <sup>(2)</sup> All these properties make milk an important food for pregnant mothers, growing children, adults and patients.

On average milk is made up of 87.4% water and 12.6% milk solids (3.7% fat, 8.9% milk solid non-fat). The milk solid non-fat contains protein (3.4%), lactose (4.8%) and minerals (0.7%). <sup>(3)</sup>

Adulteration of milk is one the most serious issue, which not only causes major economic losses for the processing industry, but also a major health risk for the consumers. Milk dealers may either dilute the milk or extract valuable component and there after add cheap substances to maintain its compositional parameters. Some of the chemicals, adulterants and malpractices result in public health concern and malnutrition. <sup>(4)</sup>

Keeping in view the above facts, the present study was conducted to achieve the following objectives.

- i) To determine the chemical composition of the loose buffalo's milk available in the market of Thane city.
- ii) To detect various adulterants in market milk.
- iii) To check the hygienic status of market milk.

## II. METHODS AND MATERIALS

Ten fresh milk samples of loose buffalo milk were collected for analysis from the selected dairy shop from following areas of Thane City during the year 2017:

- (1) Kopri
- (2) Majiwada
- (3) Vartak Nagar
- (4) Naupada
- (5) Vrundavan
- (6) Kolshet
- (7) Manpada
- (8) Vasant Vihar
- (9) Patlipada
- (10) Owale

Each sample was collected in sterilized plastic bottle with cap, labelled, kept in icebox and immediately brought to the laboratory for analysis. Each sample is tested for physical examination, chemical composition, physicochemical properties, hygienic status and detection of adulterants. The following analysis was carried out:

**Physical Examination:** Each sample was observed for color and flavor.

**Chemical Composition:** Parameters like percentage protein, fat and SNF of milk was determined by using standard procedure according to Fssai Manual 2015. Milk fat was determined by Gerber method. Protein was determined by Kjeldahl method. Solid non-fat (SNF) content of milk was determined using a formula:  $SNF = (Fat \% \times 0.21) + 0.36 + L.R/4$

**Physicochemical Properties:** Acidity in terms of percentage lactic acid was determined by standard procedure (Fssai Manual 2015). Specific gravity was determined by formula:

Specific Gravity = (lactometer reading /1000) + 1

P<sup>H</sup> of milk is determined by using P<sup>H</sup> meter.

Neutralizers are added to milk to neutralized the

developed acidity of milk. Presence of neutralizer was determined using standard procedure. <sup>(5)</sup>

**Hygienic Status:** Hygienic status of milk was determined by Methylene Blue Reduction Test (MBRT), COB (Clot on Boiling) Test and phosphatase Test. <sup>(5)</sup>

**Adulterants:** Various adulterants like detergent, sugar, starch, salt, hydrogen peroxide, urea, ammonia, nitrates were detected by using standard procedures (Fssai Manual 2015).

**Statistical Analysis:** Data collected on different parameters was analyzed statistically. The standard deviation was calculated to control the precision of examination and provide the possibility of comparing the contamination of milk. The mean, minimum and maximum values were also calculated.

## III. RESULTS AND DISCUSSION

**Physical Examination:**

**Color:** The color of all samples was creamy white.

**Flavor:** The pleasant samples contributed to 20%, not good contributed to 30% and good contributed to 50% in flavor category.

**Chemical Composition:**

**Fat:** Result showed that maximum fat observed in sample S<sub>5</sub> and S<sub>6</sub> (6.0%) while minimum was observed in sample S<sub>4</sub> (2.7%). The values of fat content in samples S<sub>1</sub> to S<sub>10</sub> were 4.8, 5.5, 5.2, 2.7, 6.0, 6.0, 5.3, 3.6, 5.4, 3.5% respectively. The difference in fat content may be due to the difference in feeding pattern, breed of animal & season. The fat values may differ due to dilution of milk with water. The result showed that the sample S<sub>4</sub>, S<sub>8</sub>, S<sub>10</sub> (2.7%, 3.6%, 3.5% fat respectively) has not maintained the standard Fssai Specification (Figure 1). <sup>(6)</sup>

**Protein:** Result showed that maximum protein content was observed in sample S<sub>7</sub> (2.90%). The minimum protein content was observed in sample S<sub>3</sub> (2.46%). The values of protein in samples S<sub>1</sub> to S<sub>10</sub> were 2.55, 2.80, 2.46, 2.55, 2.72, 2.80, 2.90, 2.90, 2.55, 2.80% respectively. All sample has shown below standard protein level of 3% (Figure 2).

**SNF:** Maximum SNF was recorded in sample S<sub>6</sub> (9.37%). The minimum was observed in S<sub>1</sub> (7.11%). The SNF content of sample S<sub>1</sub> to S<sub>10</sub> were 7.11, 8.39, 8.32, 7.42, 9.12, 9.37, 8.65, 8.62, 8.99, 9.09% respectively. The result showed that the amount of SNF recorded for 80% sample is similar to Fssai Standards (Figure 3).

**Physicochemical Properties:**

**Acidity:** Minimum acidity observed in sample S<sub>2</sub> (0.117%) followed by S<sub>5</sub> (0.054%). The maximum was observed in S<sub>7</sub> (0.146%). The acidity of samples S<sub>1</sub> to S<sub>10</sub> were 0.126, 0.117, 0.126, 0.126, 0.126, 0.140, 0.146, 0.120, 0.130%. The titrable acidity of buffalo milk varies from 0.14 to 0.15%. (Figure 4)

**Specific Gravity:** Specific gravity of sample S<sub>10</sub> (1.032) is maximum. The minimum was observed in S<sub>1</sub> (1.023). The specific gravity of samples S<sub>1</sub> to S<sub>10</sub> were 1.033, 1.0275, 1.022, 1.0262, 1.0301, 1.031, 1.030, 1.030, 1.030, 1.032. The average specific gravity ranges (at 60° F) from 1.030 to 1.032 for buffalo milk. Specific gravity is influenced by the proportion of constituents of milk. <sup>(1)</sup>

**pH:** 70% samples showed P<sup>H</sup> value 6.8 and 3% samples showed P<sup>H</sup> value 6.7. P<sup>H</sup> of fresh buffalo milk varies from 6.7 to 6.8. Higher values indicate udder infection and lower values bacterial action. <sup>(1)</sup> From present study it was observed the P<sup>H</sup> of all milk samples was within the normal range.

**Neutralizers:** The test for neutralizers was carried out for the samples under studied. The result showed absence of neutralizers.

**Hygienic Status:**

**COB (Clot on Boiling):** The result of COB test showed that all the samples have shown negative result. Therefore, all the samples are of good quality.

**MBRT (Methylene Blue Reduction Test):** one sample (10%) was found to be of very poor quality, three samples (30%) of poor quality, four samples (40%) found to be of fair quality and two samples (20%) were found to be good quality. (Figure 5) <sup>(7)</sup>

**Adulterants:** Milk samples were tested for adulterants like sugar, starch, salt, detergent, hydrogen peroxide, urea, ammonia, nitrates. No Sample was found to be adulterated.

Compositional properties of milk analysis results were presented in the Table 1. In our samples, Fat (4.8% ± 1.336%), Protein (2.70% ± 0.1473%), SNF (8.51% ± 0.7385%), Acidity (0.1285% ± 0.00864%), Specific gravity (1.029±0.00272) were found. All the values were found satisfactory.

**Table 1**

Nutrient	Samples (n = 11 Mean + SD)	Max. Value	Min. Value
Fat	4.8% ± 1.336%	6.0%	2.7%
Protein	2.70% ± 0.1473%	2.90%	2.46%
SNF	8.51% ± 0.7385%	9.37%	7.11%
Acidity	0.0.1285%±0.00864%	0.146%	0.117%
Specific Gravity	1.029±0.00272	1.032	1.023

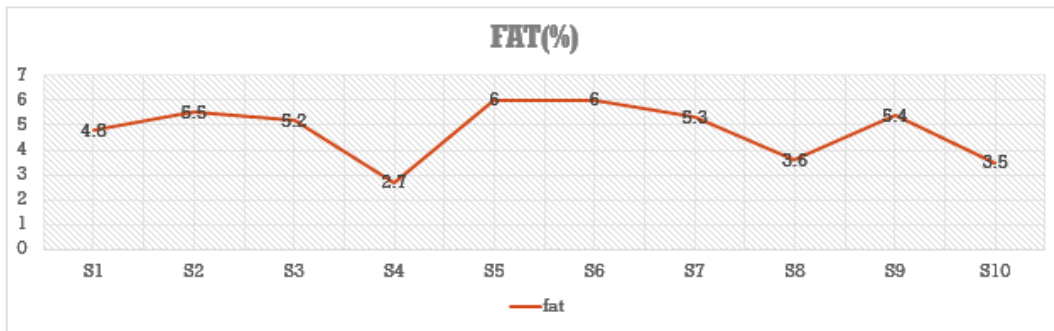


Figure 1

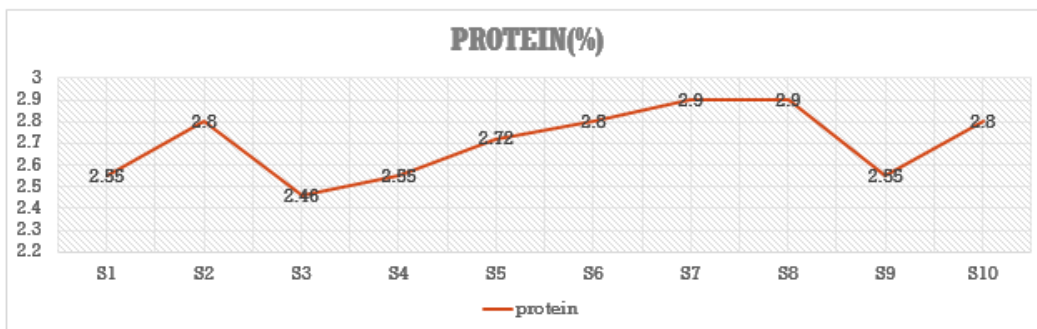


Figure 2

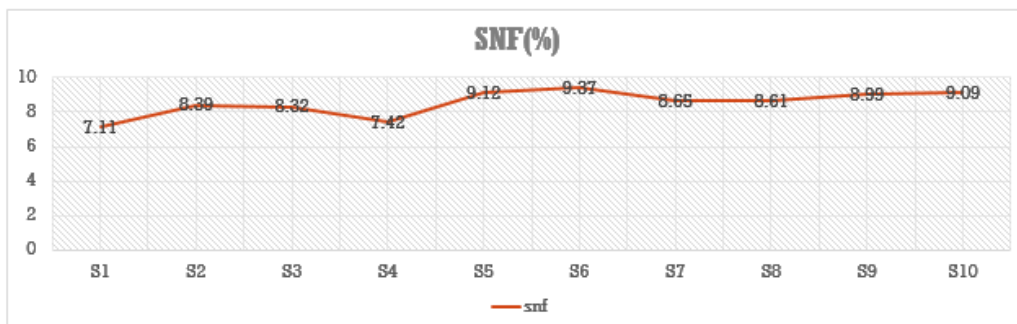


Figure 3

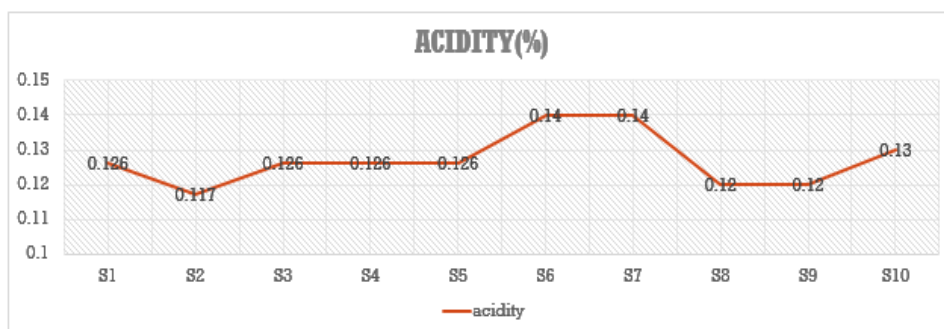


Figure 4

## Analysis of milk quality(MBRT)

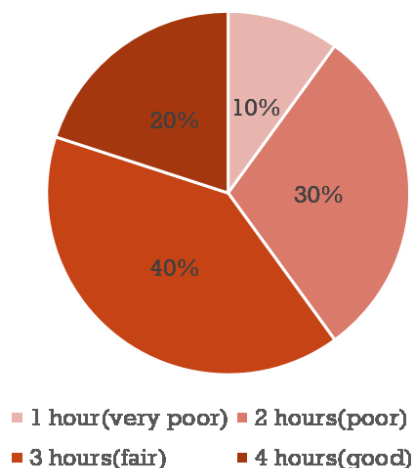


Figure 5. Analysis of milk quality(MBRT).

### IV. CONCLUSION

The statistical analysis showed that the fat, protein, SNF of samples were significantly different from each other. The physicochemical properties like  $P^H$ , specific gravity and acidity of milk samples were within the recommended level as per WHO standards. The milk samples showed absence of the adulterants.

### V. ACKNOWLEDGEMENT

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