

## Milk Quality Analysis and Adulteration in Milk Samples from Different Areas of Western U.P

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### Abstract

For a complete diet, Milk is very essential as it has an exceptional nutritive value and necessary role in human health. It has been acknowledged as a complete food for humans as it consists of essential nutrients such as proteins, carbohydrates, vitamins, fat and minerals. It helps in the maintenance of health and normal body growth. According to Global dairy industry factsheet 2020, the largest milk producing country is "India". The estimated milk production for 2020 is 196.18 million tonnes. India is producing largest amount of milk worldwide, with 22% of global production.

**Keywords:** Milk Quality; Adulteration; Milk Samples

### Introduction

As the production and demand for milk is increasing day by day, a greater frequency of milk adulteration has been seen in India followed by the other countries. The term Adulteration refers to the withdrawal of the components of milk and addition of substances to modify its consistency, taste without buyer's knowledge, which includes water, sucrose, starch, formalin, ammonium sulphate, benzoic acid, soap, salicylic acid, urea etc.

**Water:** Most commonly water is used as an adulterant, to increase the milk volume through dilution. It results in the reduction of nutrients present in the milk like solid contents and proteins. But if the water is contaminated it can cause serious health problems especially to children.

**Starch:** Starch is also the most added adulterant. It is added in milk as an adulterant to increase the solid content and thickening of milk. But excess of starch in milk can cause diarrhea due to the effects of undigested starch in colon. Its accumulation in body can be very dangerous for the diabetic patient.

**Glucose:** Generally, lower levels of glucose are present naturally in the milk but its higher levels are added as an adulterant to increase the reading of lactometer.

**Sucrose:** Generally, the sugar present in milk is Lactose but to increase the carbohydrate content of milk sucrose is added. So that density of the milk is increased. This way the milk can be adulterated and will not be detected during lactometer test.

**Formalin:** Formalin is generally used as a preservative in milk to increase its shelf life but its increased concentration in milk can be very harmful.

**Ammonium Sulphate:** It is a commonly known chemical fertilizer. It increases the density of watered milk and also raises the lactometer reading by adjusting the density of milk.

**Urea:** It is added in milk as an adulterant to provide whiteness and to elevate the consistency of milk. Also for leveling the contents of solid-not-fat (SNF) which are present in natural milk. The presence of urea overburdens the kidneys because then they have to filter out more content of urea.

**Soap:** Soaps are most commonly added adulterant to emulsify and

to give the characteristic white colour to the milk. Addition of soap in milk can cause gastro-intestinal problems.

**Benzoic acid and Salicylic acid:** They are added in the milk to increase the shelf life of the milk. Low levels of benzoic acid and salicylic acid are naturally present in the milk which causes no adverse effect on our health but their increased concentration can be harmful [1-6].

### Material and Methods

**Collection of the samples:** Forty raw samples were collected from dairy owners from different regions of Western U.P. The samples were collected from nearby areas in the morning to be transported easily without any delay. The samples were collected in 50ml screw capped sterilized bottles (Borosil). All possible precautions were taken to avoid external contamination during the time of collection of samples and during processing.

**Preparation and Storage of the samples:** In most of the cases, freshly drawn milk samples were analyzed. But few cases where the storage of milk was required due to some reasons then those milk samples were preserved by using 0.4% formalin. After that the samples were warmed to 37- 40°C by transferring it to the beaker and keeping it in a water bath maintained at 40 - 45°C. Stirred slowly for proper homogenisation. Sample was mixed thoroughly by pouring back into the bottle without shaking it, mixing to dislodge any residual fat sticking to the sides and was poured back in the beaker. Sample was then allowed to come to the room temperature (26- 28°C) and was taken immediately for analysis [7].

**Analysis of milk samples:** The samples of raw milk were analyzed for physical characteristics and the presence of adulterants. The tests for adulterants included Soap test, Urea test, Glucose test, Starch test,

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Formalin test, Salicylic acid test, Ammonium sulphate test, Sucrose test, Benzoic acid test.

**Method used for estimation:** The detection of the added adulterants was done according to “FSSAI manual” for Methods of Analysis of Foods- Milk and milk products.

**Results**

(Table 1; Figure 1) (Table 2, 3; Figure2)

**Discussion**

In our study, 40 samples were tested at room temperature (27°C) out of which 29 milk samples were found to be white, 5 light yellow and 6 were found to be yellowish white in colour with pH ranges from 6.0-7.0. These findings were supported by Judkins and Mack[2] , in their study they showed that the normal milk has yellow colour due to the presence of fat and casein. Variations in colour can be due to the

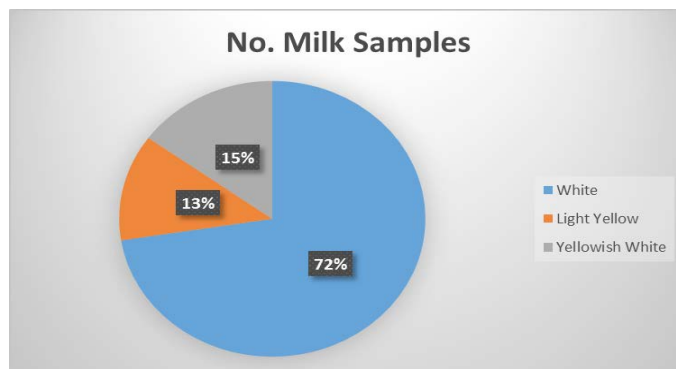


Figure 1: Analysis of Different Colours of Milk Samples.

Table 1: Physical properties of milk.

Location No.	Location (Western U.P.)	Color	pH
1	Shastri Nagar	White	6.7
2	Vedvyaspuri	White	6.4
3	Bharala	Light Yellow	6.9
4	Khadoli	White	6.5
5	Pachgaon Patti	Yellowish White	6.8
6	Jani	White	6.8
7	Pooth	White	6.4
8	Dorala	White	6.0
9	Partapur	White	6.8
10	Meerpur	White	6.4
11	Mohanpuri	White	6.4
12	Meerut Cantt	White	6.5
13	Dedwa	Yellowish White	7.0
14	Satwai	White	6.4
15	Lisari Gate	White	6.8
16	Bagbat Bypass	White	6.9
17	Jalalpur	White	6.4
18	Parikshitgarh	White	6.8
19	Mayur Vihar	White	6.8
20	Ganga Nagar	White	6.8
21	Begum Bridge	White	6.8
22	Chanakya Puri	White	6.0
23	Saket	White	6.4
24	Jagriti Vihar	White	6.4
25	Salarpur	Light Yellow	6.9
26	Kaseru Baksar	Yellowish White	7.0
27	Lakhmi Vihar	White	6.5
28	Pallavpuram	White	6.5
29	Modipuram	White	6.5
30	Sheel Kunj	Light Yellow	6.9
31	Tej Vihar	Light Yellow	6.9
32	Rohta Road	White	6.9
33	Panchli Khurd	Yellowish White	6.8
34	Metro Plaza	White	6.8
35	Devpuri	Light Yellow	7.0
36	Hapur Road	White	6.9
37	Garh Road	White	6.5
38	Ghantaghar	Yellowish White	6.9
39	Delhi Road	White	6.9
40	Suraj Kund	Yellowish White	6.8

Table 2: Detection of adulterants in milk samples.

S. No.	ADULTERANT	TEST	POSITIVE SAMPLE
1	STARCH	IODINE TEST	0
2	GLUCOSE	PHOSPHOMOLYBDIC TEST	32
3	SUCROSE	MODIFIED SELIWANOFF'S TEST	25
4	FORMALIN	HEHNER'S TEST	28
5	AMMONIUM SULPHATE	BARIUM CHLORIDE TEST	32
6	UREA	DMAB TEST	26
7	SOAP	PHENOLPHTHALEIN TEST	05
8	BENZOIC ACID	FERRIC CHLORIDE TEST	25
9	SALICYLIC ACID	FERRIC CHLORIDE TEST	07

Total 80% of samples were found to be adulterated

Table 3: Analysis of different adulterants found in the milk samples.

Adulterants	% of Positive Milk Samples
Glucose	80
Ammonium Sulphate	80
Formalin	70
Urea	65
Sucrose	62.5
Benzoic Acid	62.5
Salicylic Acid	17.5
Soap	12.5

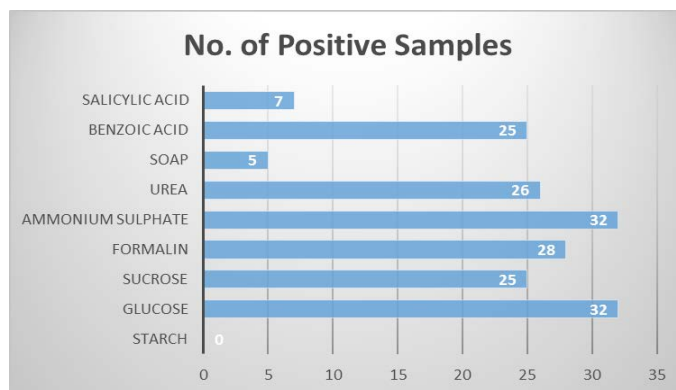


Figure 2: Analysis of Adultrants Found in Milk Samples.

differences in nature of cattle feed consumption, breed of cattle or the the fat and solid content of milk.

As per our analysis, out of 40 samples, 8 milk samples were of very good quality. 27 samples were of moderate quality white 5 samples were of very poor quality. Out of 40 milk samples adulteration of

glucose (80%) and ammonium sulphate (80%) was highest, followed by formalin (70%), urea (65%), sucrose (62.5%), benzoic acid (62.5%), salicylic acid (17.5%) and soap (12.5%) respectively, while starch was absent in all the tested milk samples. Similar findings were observed by Kandpal et al[6] in their study.

## Conclusion

This study clearly signifies that the quality of milk is not fully appropriate according to the standards of FSSAI and the adulteration in milk is still being practiced at high rates in western U.P. We don't have proper quality control system which can check the quality of milk that is sold on regular basis. Consumption of the adulterated milk can lead to serious health issues; the consumer must be aware regarding the milk adulteration and its adverse effects on health. Therefore, authorities' should run awareness programme's related to milk adulteration on a wide scale. It may help in decreasing such malpractices.

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